http://HamShare.com

High Performance Repeaters

by

Bill Balzarini
KL7BB

Federal Way
WA7FW
Amateur Radio Club

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Analog and Digital RF Repeater Design Considerations for Emergency E O C Use.

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High Performance Repeaters

HP-RPTRs

Repeaters with “-100db down dynamic range

Pictures
WA7FW Systems

3 **A**nalog FM
146/440

5 **D**igital systems on
146/440/1.2GHz

Managing the
RF Spectrum

Organizational, Social & Political,
“SHB-2335”, Zones, Coverage and Loading
Lease-Hold-Excise-Tax-Relief-RCWs

Technical RF: As Viewed from
“-100dbm down” at your
repeaters Receiver

Duplexers

Radios, Antennas
& Repeaters

FM+PL Analog

Digital D-STAR

CTEK-7002 Battery
Reconditioner/Charger

Marketing + Sales:
Technical Jargon
by all Manufactures

Lunch

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Served Agency

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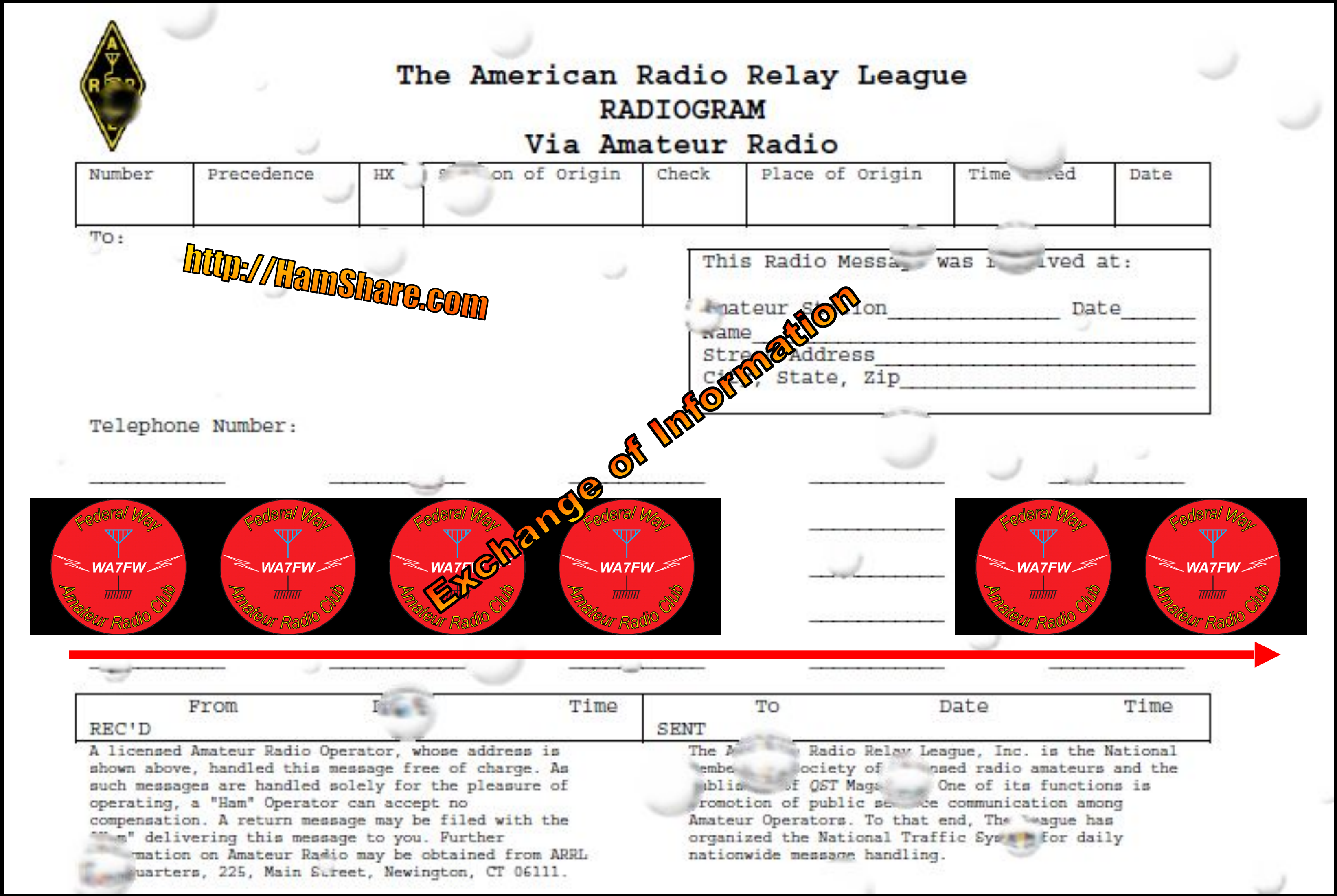
Federal Way
WA7FW
Amateur Radio Club



The American Radio Relay League
RADIOGRAM
Via Amateur Radio

Number	Precedence	HX	Station of Origin	Check	Place of Origin	Time Filed	Date

To:

http://HamShare.com

This Radio Message was received at:

Amateur Station_______________ Date______
Name________________________________
Street Address______________________
City, State, Zip____________________

Telephone Number:

Exchange of Information

REC'D	From	Date	Time		
SENT				To	Date	Time

A licensed Amateur Radio Operator, whose address is shown above, handled this message free of charge. As such messages are handled solely for the pleasure of operating, a "Ham" Operator can accept no compensation. A return message may be filed with the "Ham" delivering this message to you. Further information on Amateur Radio may be obtained from ARRL Headquarters, 225, Main Street, Newington, CT 06111.

The American Radio Relay League, Inc. is the National membership society of licensed radio amateurs and the publisher of *QST* Magazine. One of its functions is promotion of public service communication among Amateur Operators. To that end, The League has organized the National Traffic System for daily nationwide message handling.

And each Agency has their own version of a message form

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High Performance Repeaters

The Words of ARRL Communications Manager George Hart W1NJM at the Washington State ARRL Hamfest in Yakima, paraphrased JFK's words and asked,

"Ask not what the ARRL can do for you, Ask what you can do for the ARRL and Amateur Radio".

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High Performance Repeaters

VHF DIRECTORY FOR WASHINGTON STATE (Era 1969) (~10,000 Copies)

2 METERS
150.090 FM OUTPUT OF CAPITOL PEAK NAVY MARS REPEATER (OLYMPIA)
ALSO INPUT TO ARLINGTON NAVY MARS REPEATER
148.410 FM --- INPUT TO CAPITOL PEAK NAVY MARS REPEATER (OLYMPIA)
ALSO OUTPUT OF ARLINGTON NAVY MARS REPEATER
148.010 AM ARMY MARS NET. ON MONDAY NIGHTS AT 10:01 PM
147.750 FM --- DX CHANNEL FOR 20 METER DX ERS
147.330 FM CANADA POPULAR FM FREQ. USE THIS FREQ. FOR CONTACTS !!!
147.210 FM --- YAKIMA REPEATER OUTPUT (COMES IN ON 145.260)
ALSO THIS IS THE INPUT FREQ. TO THE WENATCHEE AM
REPEATER WHICH COMES OUT ON 145.62 MHZM FOR INFO
CONTACT JIM K7UDG IN WENATCHEE.
146.940 FM C.D. WORK AND VERIOUS PUBLIC SERVICE WORK SUCH AS
THE SPORT CAR RACES AT SEATTLE INTERNATIONAL RACEWAY.
146.880 FM --- C.D. WORK ON THURSDAY NIGHTS.

146.760 FM LARGEST NORTHWEST FM NET FREQ. ALSO INPUT FREQ. TO
SEATTLE REPEATER WHICH COMES OUT ON 146.580 MHZ.

THIS IS ALSO THE OUTPUT FREQ. OF THE SOAP LAKE REPEATER
146.76 MHZ . THE INPUT IS ON 146.34 MHZ.
146.76 MHZ IS ALSO THE OUTPUT OF THE SPOKANE REPEATER
AND THE INPUT IS ON 146.34 MHZ IT IS ON MT. SPOKANE.
FOR MORE INFO CONTACT W7GSS + W7PUL.

As ARRL VHF-PAM for WA.

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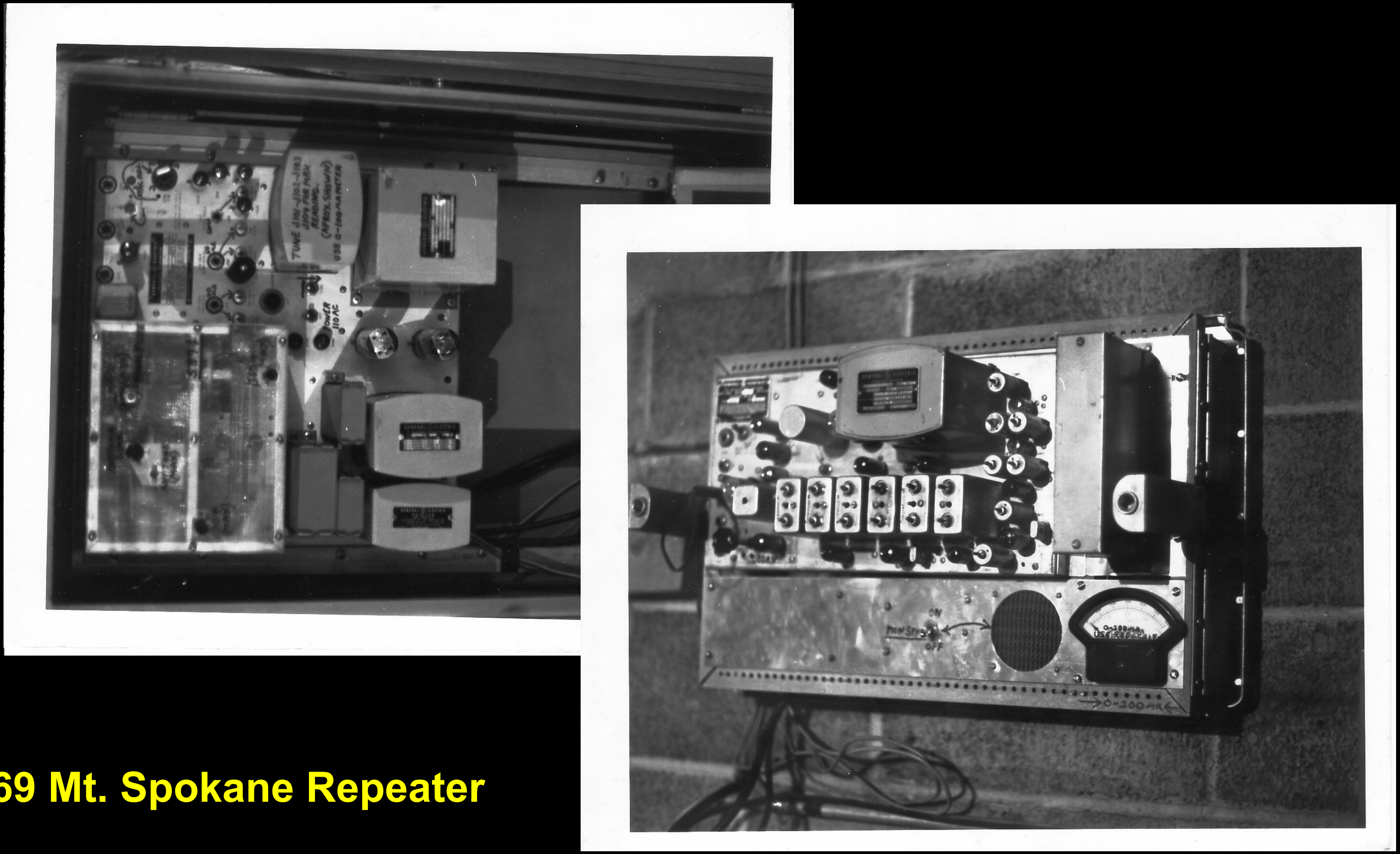
High Performance Repeaters



1969 Mt. Spokane Repeater

© 2012 KL7BB

High Performance Repeaters

1969 Mt. Spokane Repeater

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146.640 FM --- TACOMA AREA FREQ.

146.580 FM OUTPUT OF SEATTLE REPEATER WHICH HAS TWO INPUT FREQ.S OF 146.76 AND 146.34 MHZ

146.460 FM LOCAL SEATTLE AREA NET FREQ.

146.340 FM --- MOBILE CALLING FREQ. FOR THE SEATTLE REPEATER. OUTPUT IS ON 146.580 MHZ

146.250 AM LOCAL SOUTHWEST WASHINGTON AND NORTH OREGON RAG CHEW FREQ ON MOSTLY IN THE EVENING.

145.800 AM --- THIS FREQ. IS USED MOSTLY WHEN 145.35 IS IN USE.

145.620 AM OUTPUT OF WENATCHEE REPEATER INPUT IS ON 147.21 AM FOR MORE INFO CONTACT JIM K7UDG

145.350 AM --- LOCAL CALLING FREQ. FOR THE LARGEST 2 METER AM NET ACTIVE MOSTLY DURING THE EVENING (AFTER 8 PM) WITH AREC NETS EVERY NIGHT AT 8 PM MONDAY THRU FRIDAY FOR THE SOUTHWEST WASHINGTON AREA. CONTACT WA7DLE + WA7IJV + WA7DDH FOR MORE INFORMATION.

145.260 FM YAKIMA REPEATER INPUT FREQ. (GOES OUT ON 147.21 MHZ)

144.200 SSB -- SSB CALLING FREQ. FOR STATIONS FROM CANADA TO OREGON.

143.990 AM ARMY MARS NET ON AT 8:01 PM TUESDAYS ALSO ON SATURDAY AT 10:01 AM WITH RTTY (AFSK)

143.950 AM --- AIRFORCE MARS NET. ALSO AIRFORCE MARS RTTY FREQ. RTTY ON TUESDAY NIGHTS AT 8:00 PM LOCAL TIME (AFSK MODE)

143.700 AM OUTPUT OF ARLINGTON NAVY MARS REPEATER ALSO INPUT TO CAPITOL PEAK NAVY MARS REPEATER (OLYMPIA)

139.560 AM --- INPUT TO ARLINGTON NAVY MARS REPEATER ALSO OUTPUT OF CAPITOL PEAK NAVY MARS REPEATER (OLYMPIA)

As ARRL VHF-PAM for WA.

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High Performance Repeaters

VHF DIRECTORY FOR WASHINGTON STATE (Era 1969)

6 METERS

53.950 FM OUTPUT OF SPACENEEDLE REPEATER
53.528 FM --- SEATTLE TACOMA JEEP CLUB
53.500 FM C.D. WORK SOUTH OF SEATTLE
53.460 FM RADIO SYSTEMS TRANSMIT FREQ. (REPEATER OUTPUT)
53.420 FM W7FKL (REPEATER)
53.400 FM --- NORTHWEST AMATEUR RADIO COMMUNICATIONS SYSTEM INC.
AREC NET AND THURSTON COUNTY RACES NET. NET ROLL CALL
FOR THIS FREQ. IS AT 12:00 NOON ON SATURDAYS.
24 HOURS MONITOR " QUIET HRS 10 PM TO 8 AM "
FOR MORE INFORMATION CONTACT W7GJL
53.290 FM --- LARGEST 6 METER FM NET IN WASHINGTON THIS IS ALSO
THE OUTPUT FREQ. OF THE BADGER MT. REPEATER FOR MORE
INFO CONTACT W7OEB.
52.800 FM RADIO SYSTEMS RECEIVER FREQ. (REPEATER INPUT)
52.525 FM NATIONAL CALLING FREQ. FOR FM -(ACTIVE IN SEATTLE EVERETT
INPUT TO REPATER AT EVERETT AT K7KSZ OUTPUT ON 53.290

As ARRL VHF-PAM for WA.

© 2012 KL7BB

High Performance Repeaters

VHF DIRECTORY FOR WASHINGTON STATE (Era 1969)

6 METERS

51.000 AM --- LOCAL AM NET ON MOSTLY IN THE EVENINGS. REBEL NET IS
ON THIS FREQ. THE 1ST AND 3RD TUESDAYS OF THE MONTH
AT 8:00 PM LOCAL TIME.
50.850 AM --- AREC NET FREQ. ON MONDAY NIGHTS AT 8:00 PM LOCAL TIME.
50.400 AM LOCAL CALLING FREQ. VERY ACTIVE AM CHANNEL WITH AM MOBILE
WORK. ALSO THE HEDGE HOPPERS NET ON SUNDAY NIGHT
WITH WA7FVT AS NET CONTROL STATION.
50.110 SSB -- SSB LOCAL CALLING FREQ. THIS IS THE MOST POPULAR PLACE
FOR SSB AND DX.
50.098 CW CW BEACONS ON THIS FREQ. FROM ALL OVER THE GLOBE.
49.980 AM --- AIRFORCE MARS NET. ALSO AIRFORCE MARS RTTY FREQ.
49.940 AM ARMY MARS NET TUESDAY AT 8:01 PM
49.692 AM---- NAVY MARS NET ALSO NAVY MARS RTTY FREQ.

As ARRL VHF-PAM for WA.

IF YOU WANT YOUR ACTIVITIES LISTED ON THIS DIRECTORY, WILL YOU
PLEASE CONTACT K7MWC IN SEATTLE WASHINGTON AT 1518 SOUTH PEARL STREET
PHONE NUMBER RO2-7738

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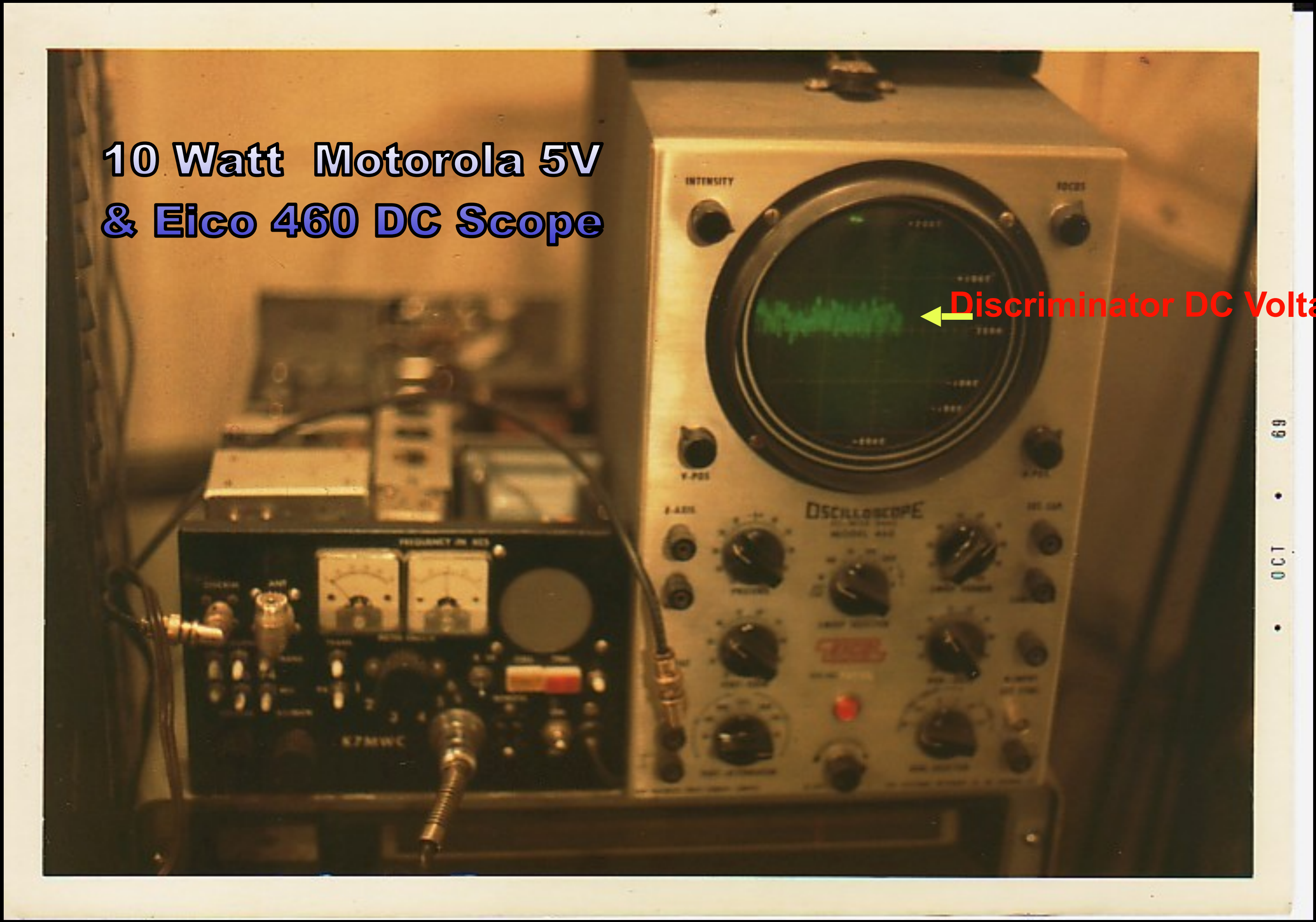
High Performance Repeaters



10 Watt Motorola 5V
& Eico 460 DC Scope

Discriminator DC Voltage

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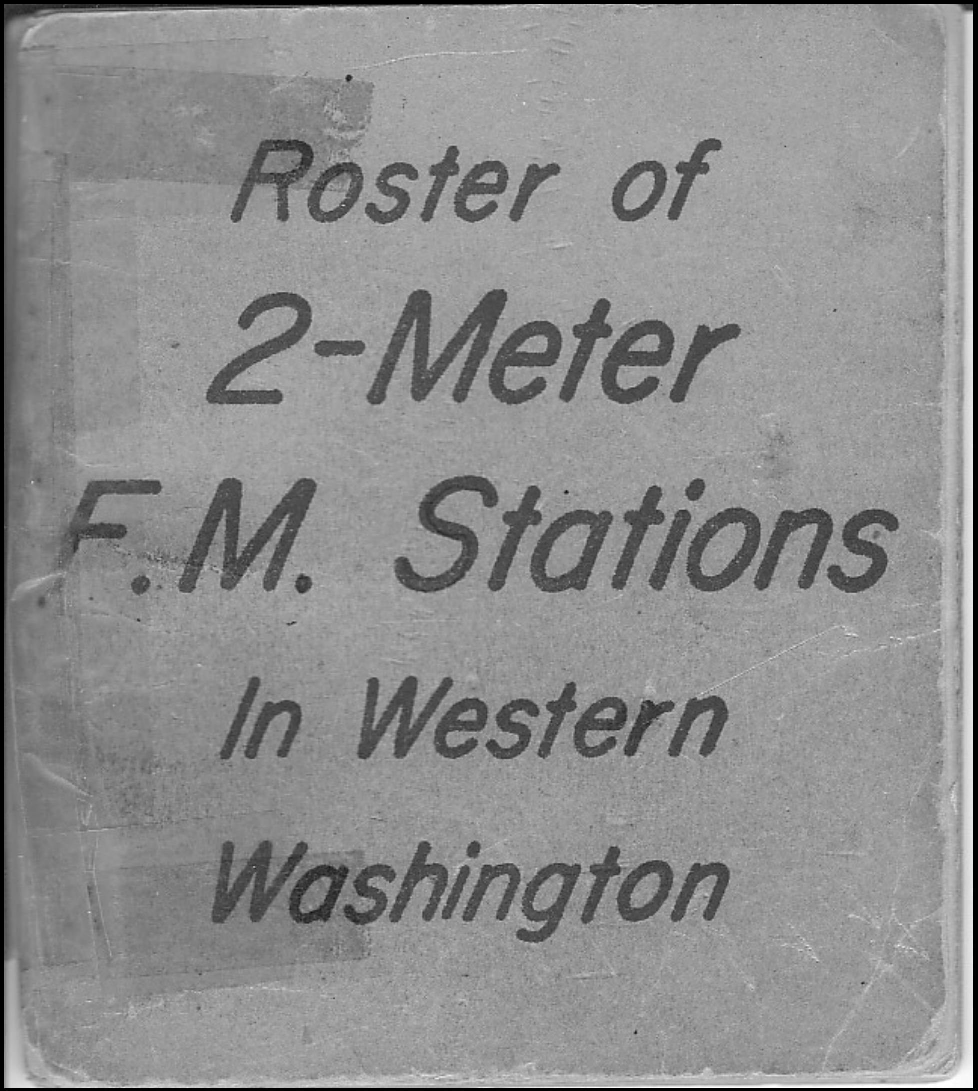
High Performance Repeaters



Roster of
2-Meter
F.M. Stations
In Western
Washington

K 7 M W C

Mobile Amateur Communications Systems Inc. June 1, 1961

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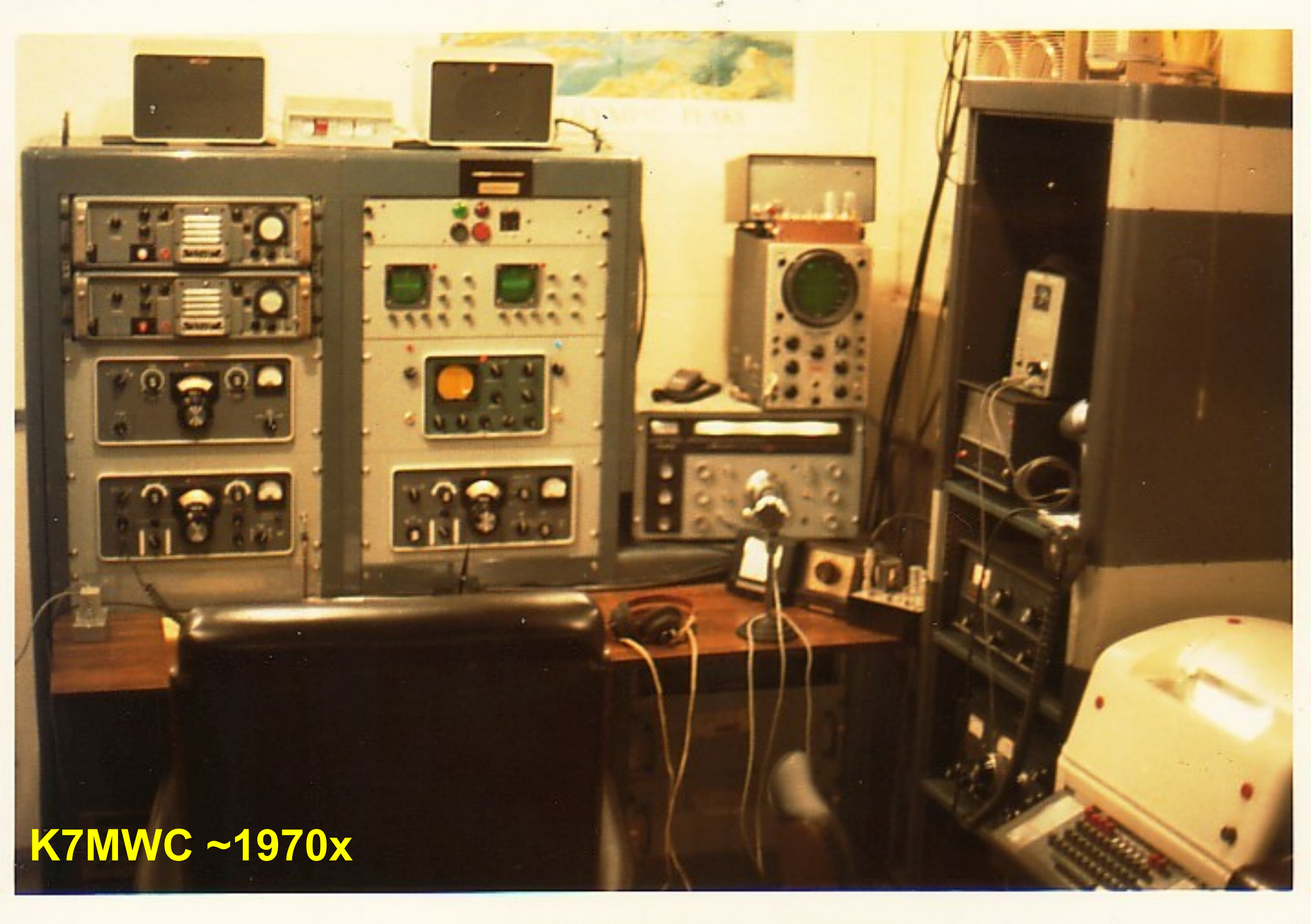
High Performance Repeaters



K7MWC ~1970x

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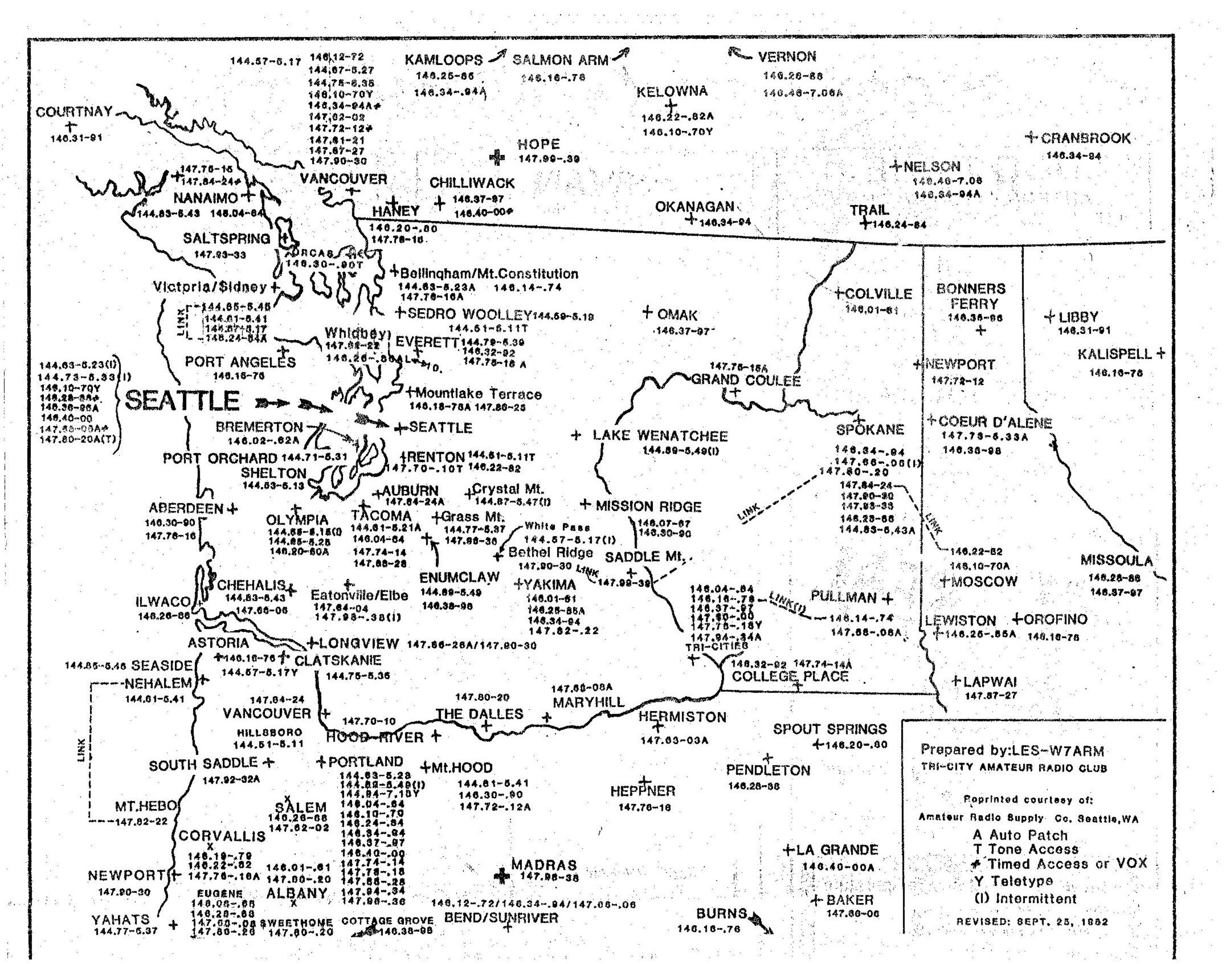
W7ARM



W7ARM

1977 SEA-Q-DX

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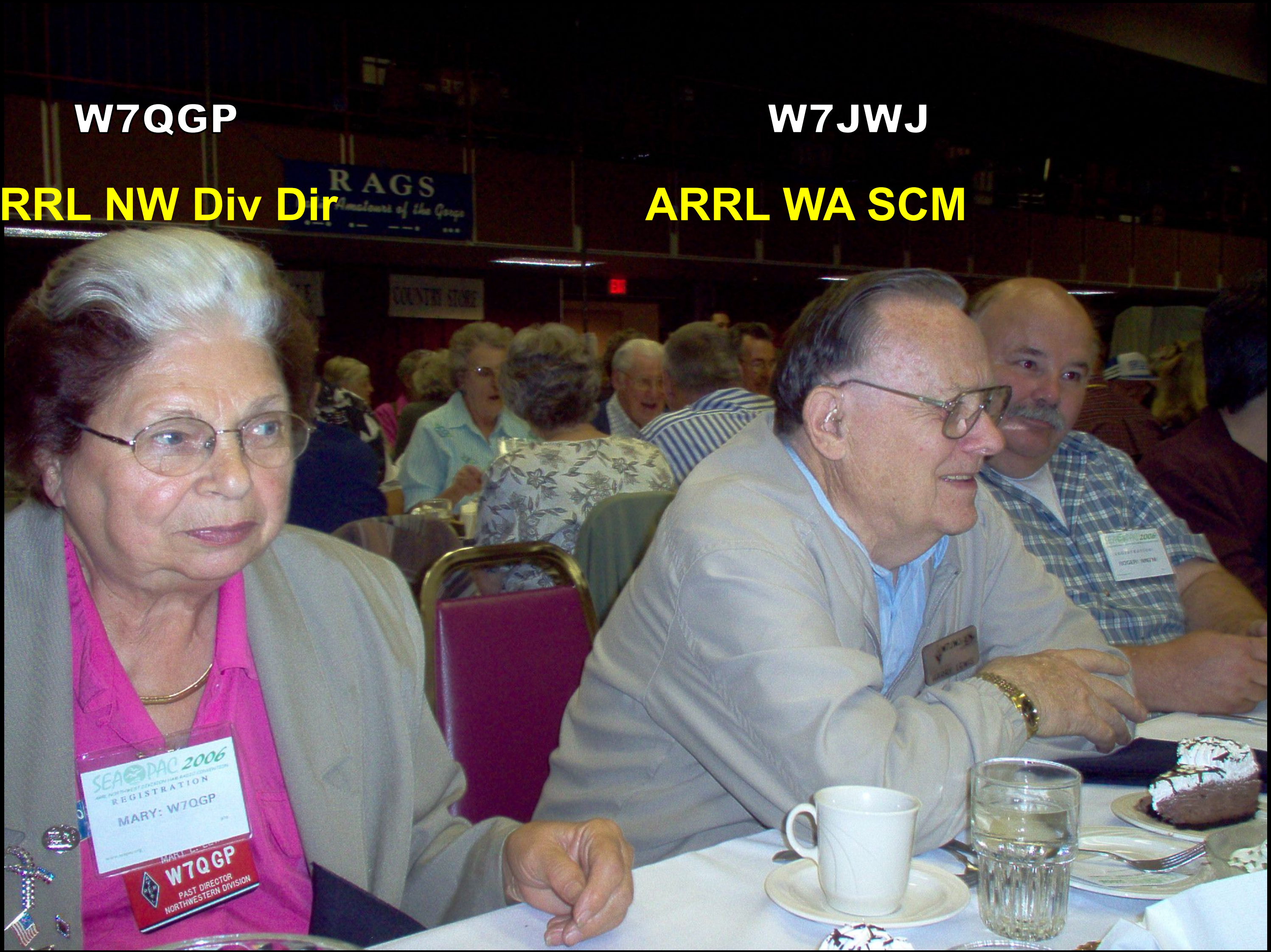
High Performance Repeaters



W7QGP

ARRL NW Div Dir

W7JWJ

ARRL WA SCM

SEA
PAC
200X

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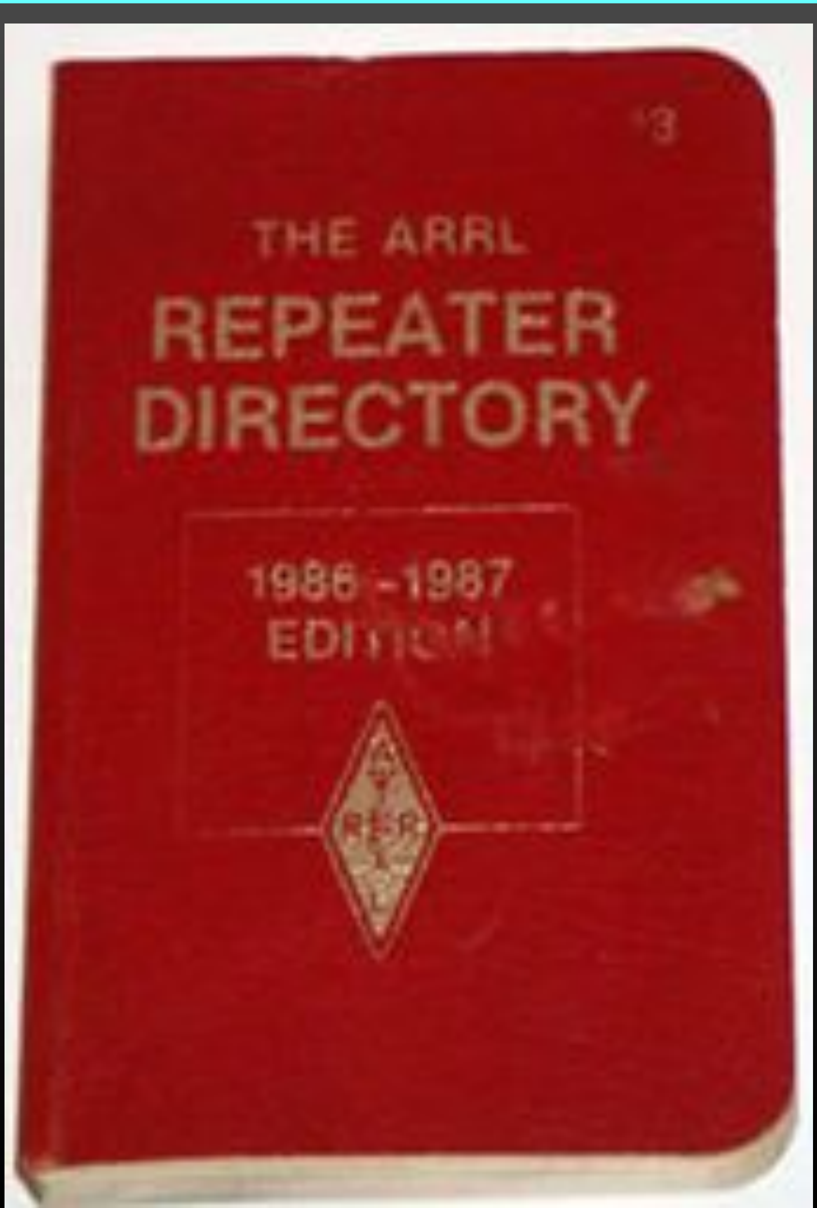
High Performance Repeaters



1986

NW Division Director W7QGP wanted information published in the ARRL1986 Repeater Directory, to be in a small size, so that it would fit into her purse.

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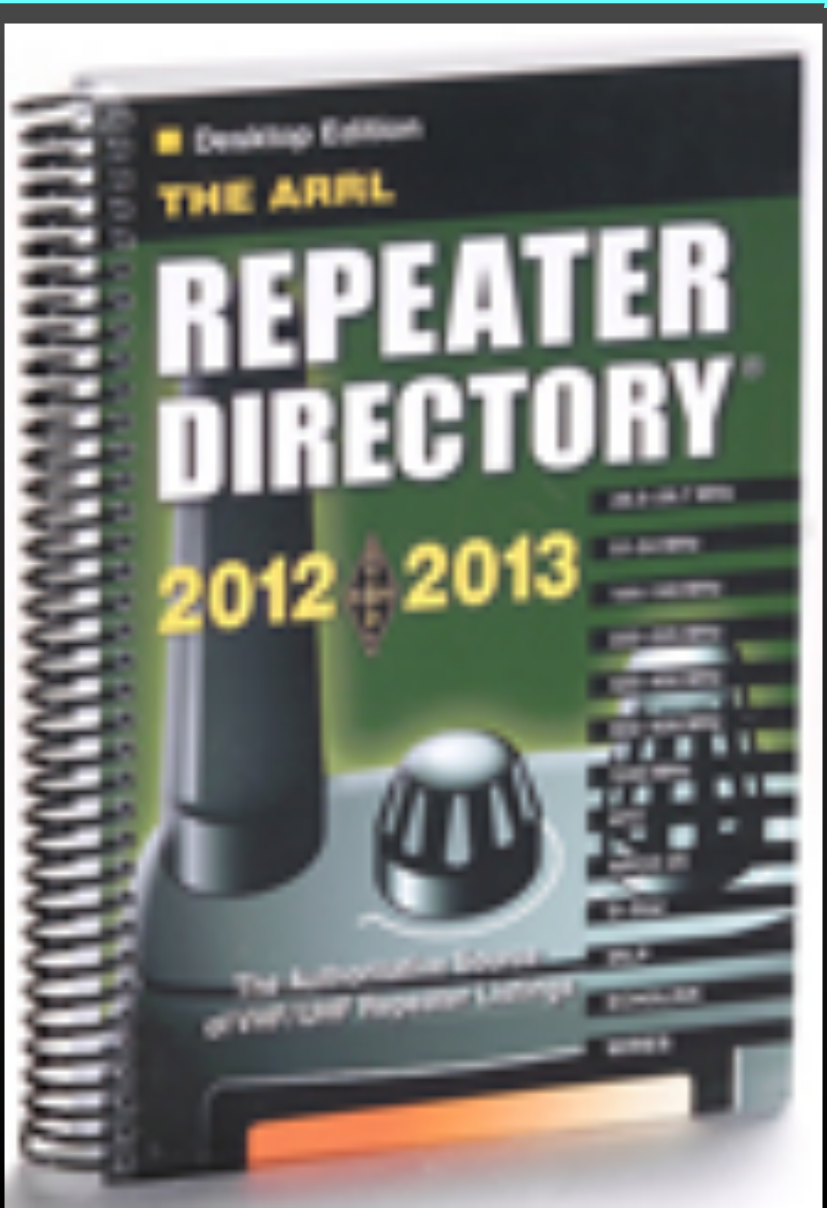
High Performance Repeaters



2013

WWARA.org information published in the ARRL 2012-13 Repeater Directory

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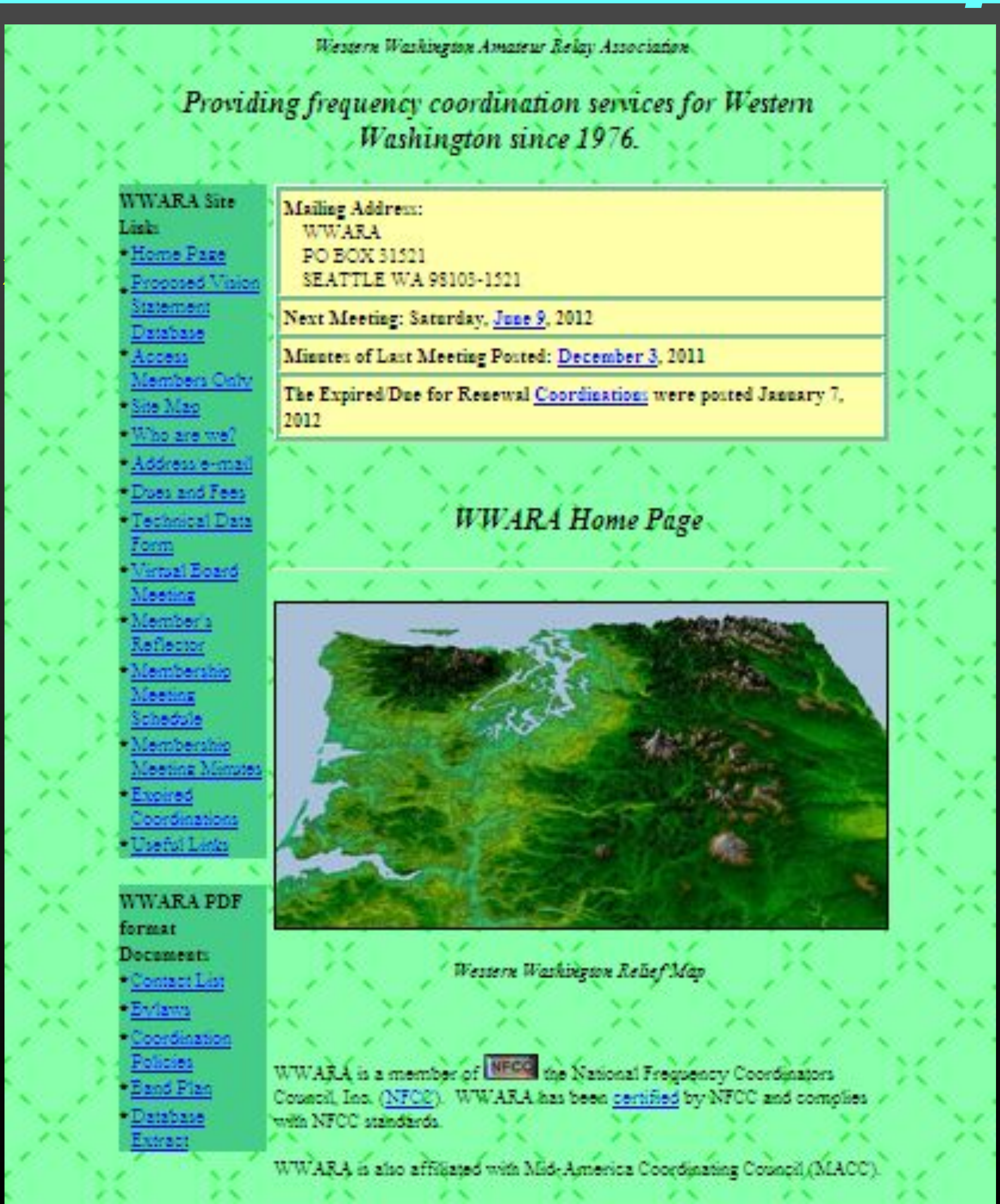
High Performance Repeaters

Insert pi



Western Washington Amateur Relay Association

Providing frequency coordination services for Western Washington since 1976.

WWARA Site Links:

- Home Page
- Proposed Vision Statement Database
- Access Members Only
- Site Map
- Who are we?
- Address e-mail
- Dues and Fees
- Technical Data Form
- Virtual Board Meeting
- Member's Reflector
- Membership Meeting Schedule
- Membership Meeting Minutes
- Expired Coordinations
- Useful Links

WWARA PDF format Documents:

- Contact List
- Bylaws
- Coordination Policies
- Band Plan
- Database Extract

Mailing Address:
WWARA
PO BOX 31521
SEATTLE WA 98103-1521

Next Meeting: Saturday, June 9, 2012

Minutes of Last Meeting Posted: December 3, 2011

The Expired/Due for Renewal Coordinations were posted January 7, 2012

WWARA Home Page

Western Washington Relief Map

WWARA is a member of NFCC the National Frequency Coordinators Council, Inc. (NFCC). WWARA has been certified by NFCC and complies with NFCC standards.

WWARA is also affiliated with Mid-America Coordinating Council (MACC).

WWARA.org

WWARA.org information is published in the ARRL 2012-13 Repeater Directory, it is supplied approx Feb of each Year

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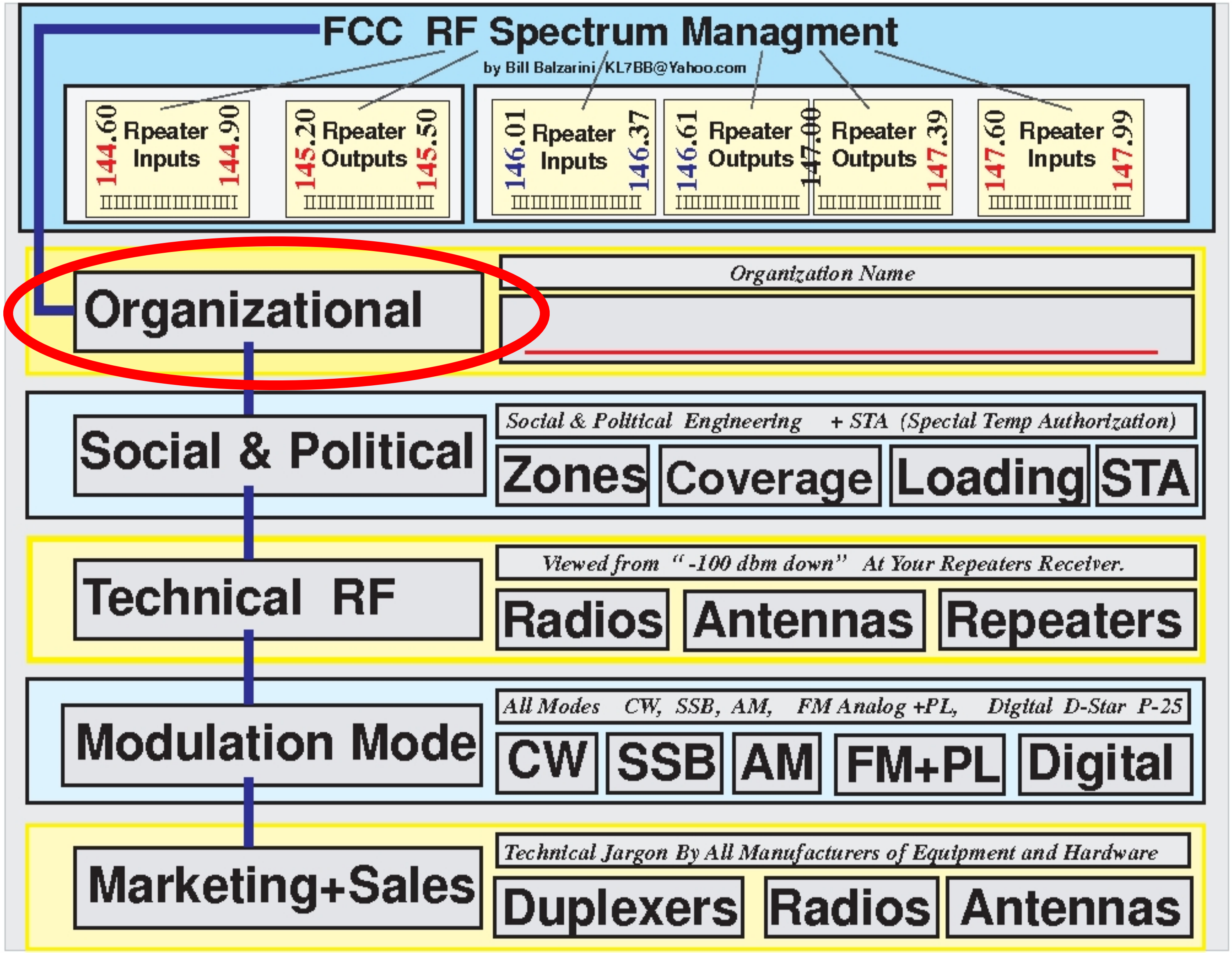
High Performance Repeaters



FCC RF Spectrum Managment

by Bill Balzarini/KL7BB@Yahoo.com

144.60 Rpeater Inputs 144.90

145.20 Rpeater Outputs 145.50

146.01 Rpeater Inputs 146.37

146.61 Rpeater Outputs 147.00

147.00 Rpeater Outputs 147.39

147.60 Rpeater Inputs 147.99

Organizational

Organization Name

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios | Antennas | Repeaters

Modulation Mode

All Modes CW, SSB, AM, FM Analog +PL, Digital D-Star P-25

CW | SSB | AM | FM+PL | Digital

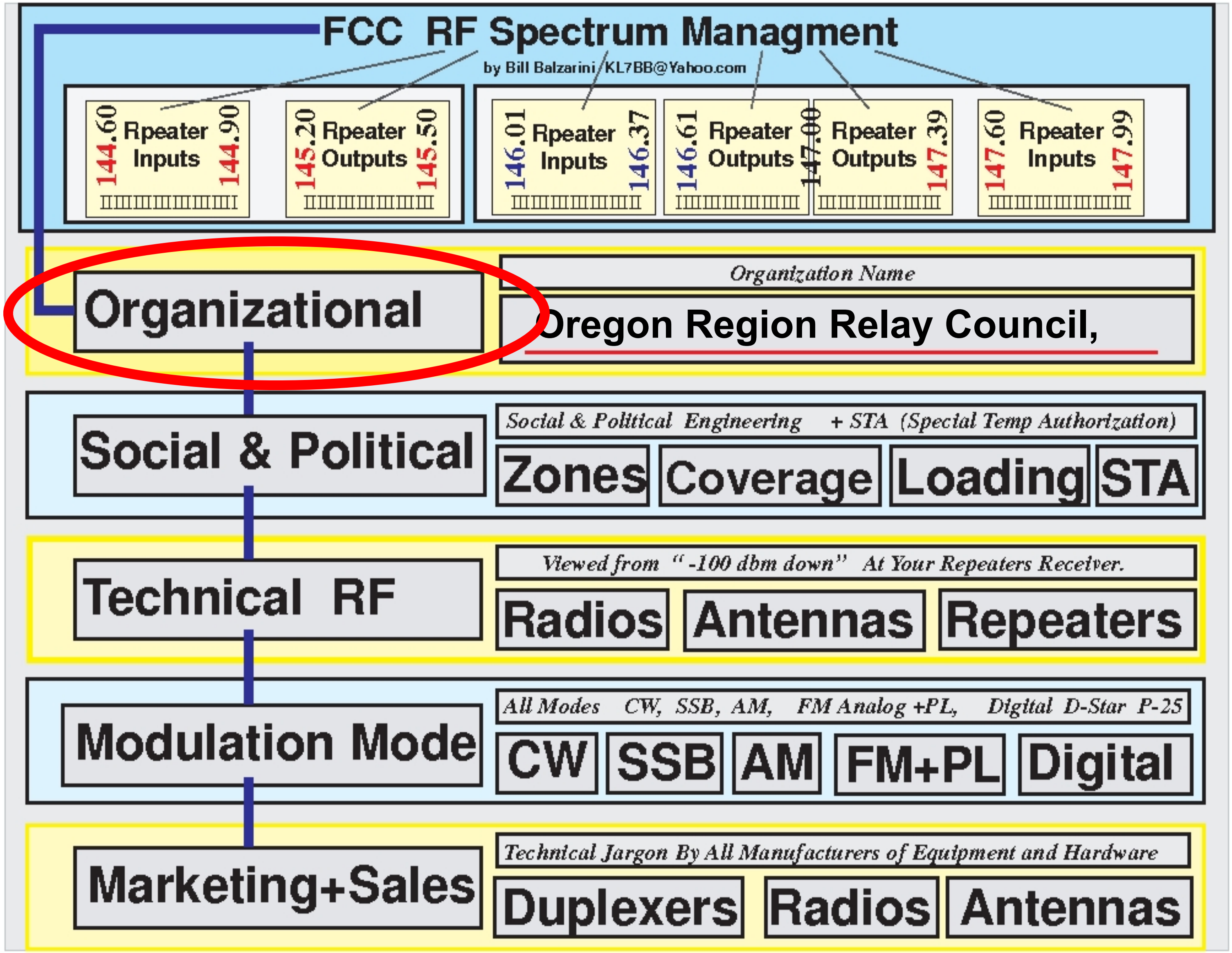
Marketing+Sales

Technical Jargon By All Manufacturers of Equipment and Hardware

Duplexers | Radios | Antennas

© 2012 KL7BB

High Performance Repeaters



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147.00 Rpeater Outputs 147.39
147.60 Rpeater Inputs 147.99

Organizational

Organization Name

Oregon Region Relay Council,

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios | Antennas | Repeaters

Modulation Mode

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CW | SSB | AM | FM+PL | Digital

Marketing+Sales

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Duplexers | Radios | Antennas

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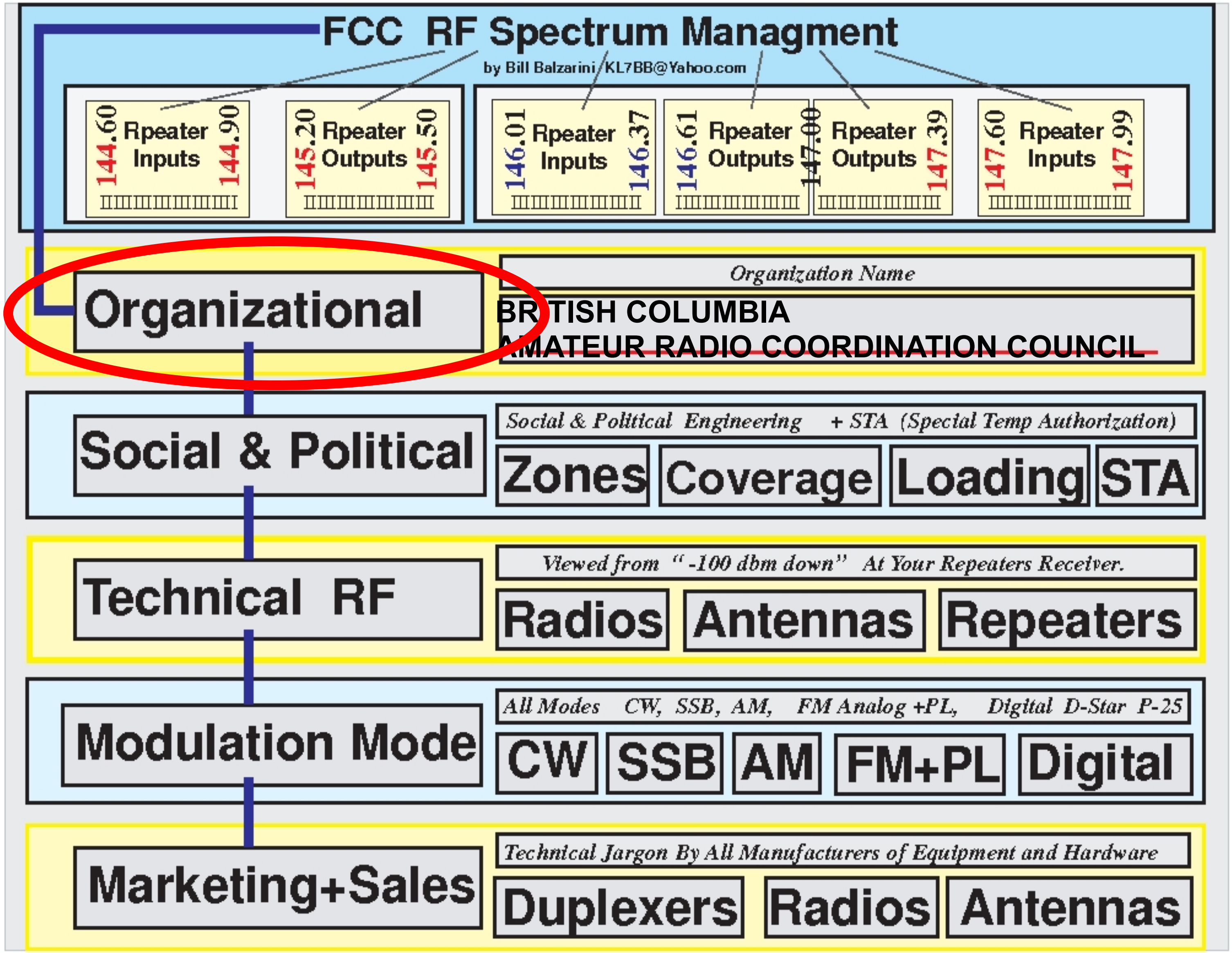

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Rpeater Outputs 147.39
147.60 Rpeater Inputs 147.99

Organizational

Organization Name

BRITISH COLUMBIA
AMATEUR RADIO COORDINATION COUNCIL

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios | Antennas | Repeaters

Modulation Mode

All Modes CW, SSB, AM, FM Analog +PL, Digital D-Star P-25

CW | SSB | AM | FM+PL | Digital

Marketing+Sales

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Duplexers | Radios | Antennas

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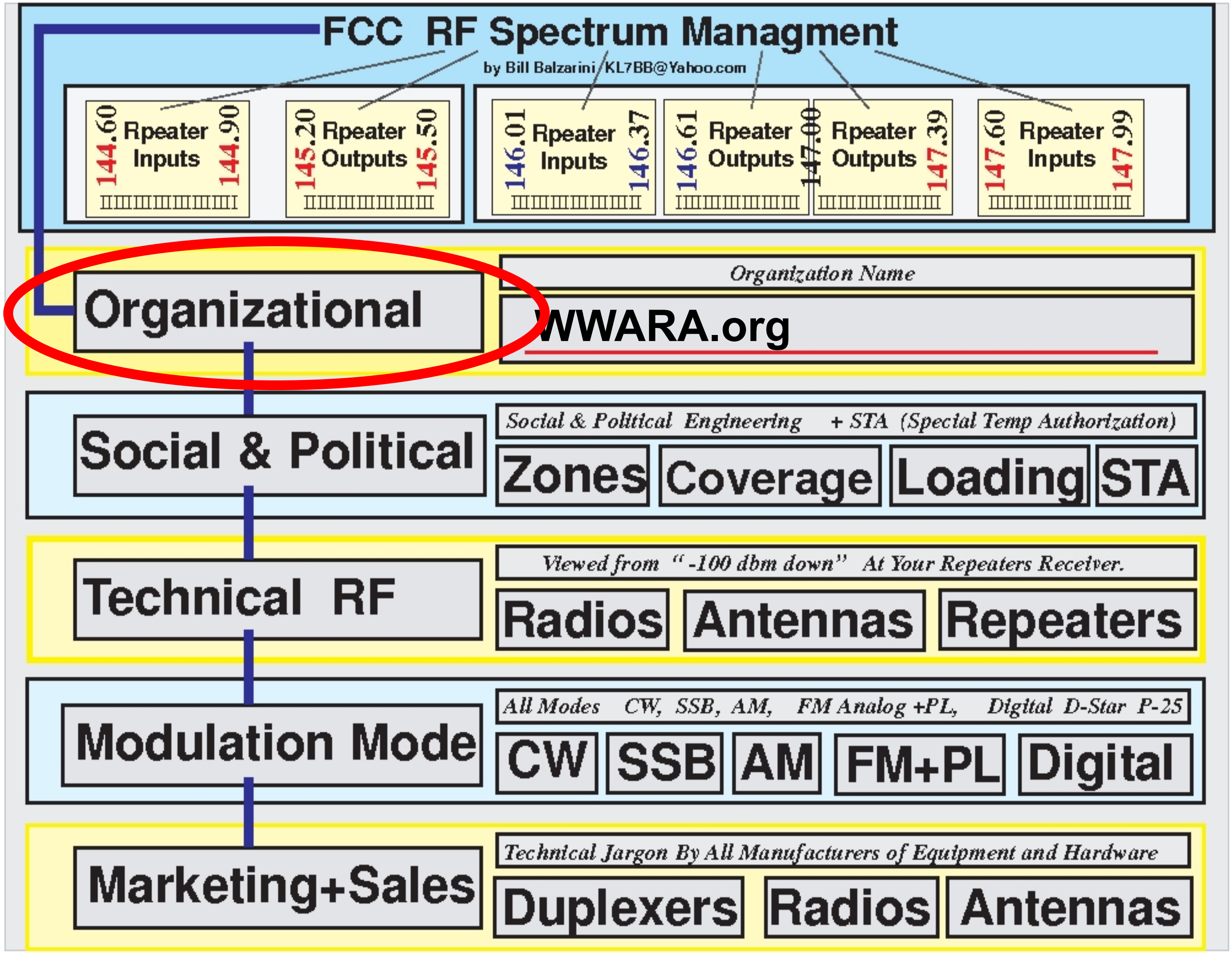

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147.60 Rpeater Inputs 147.99

Organizational

Organization Name

WWARA.org

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

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Modulation Mode

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CW | SSB | AM | FM+PL | Digital

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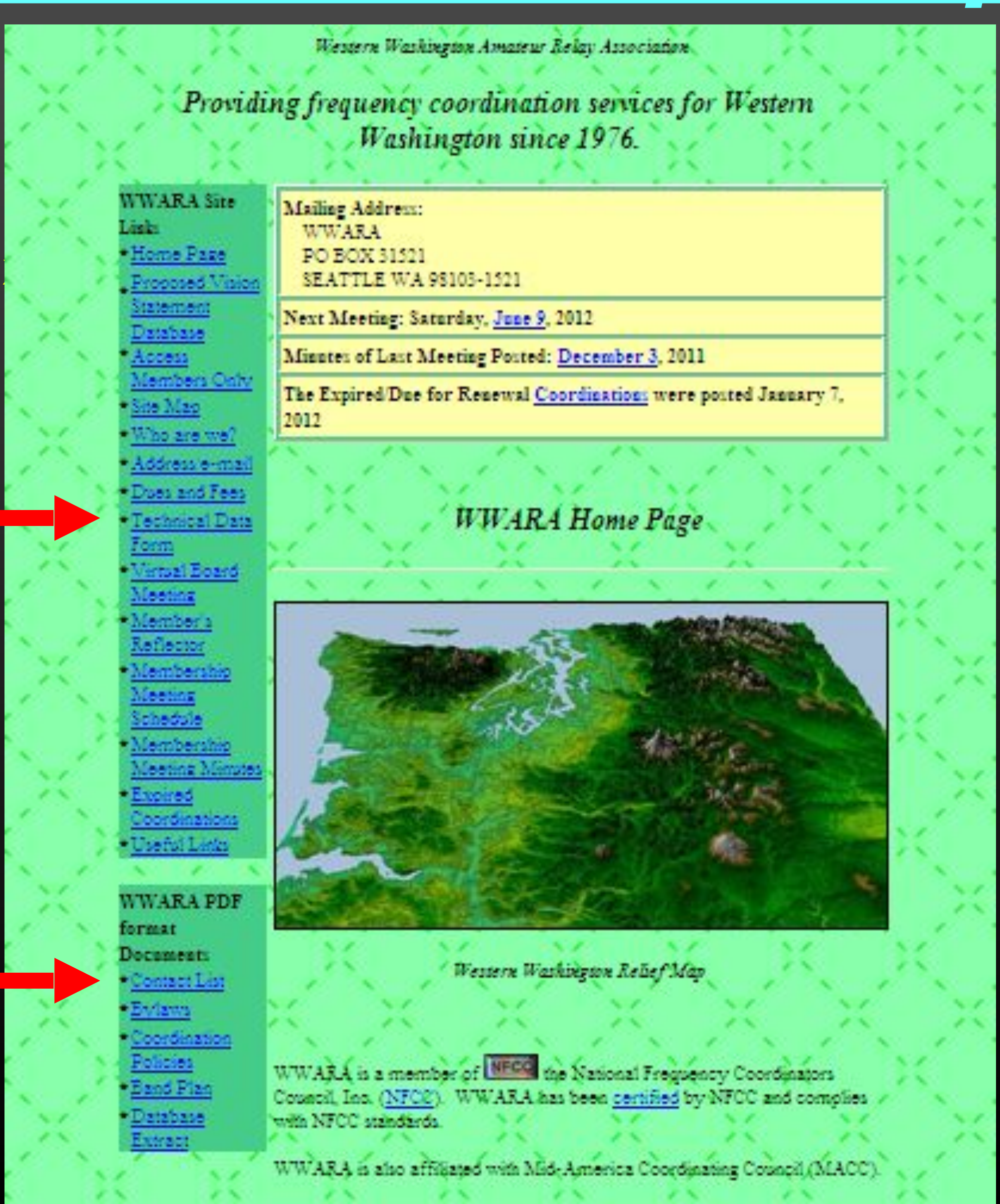

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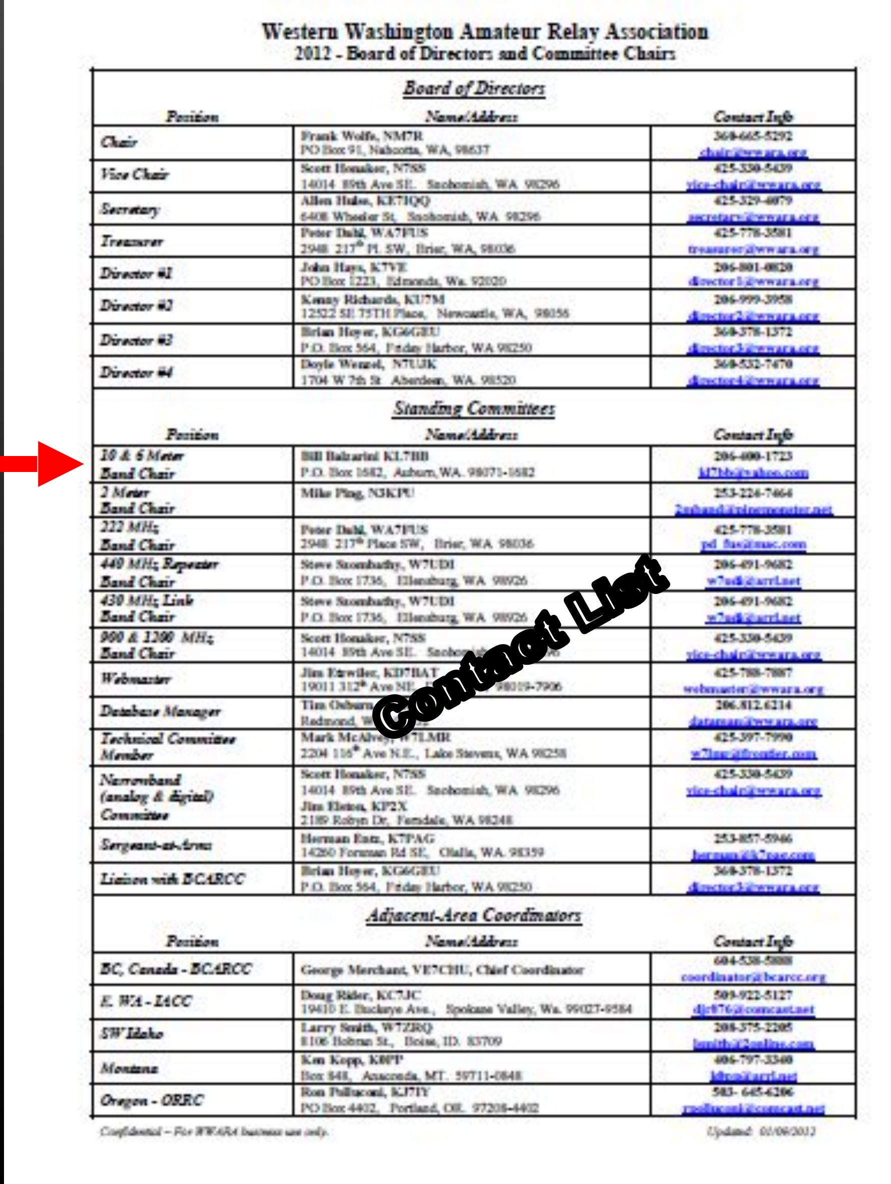

Western Washington Amateur Relay Association
2012 - Board of Directors and Committee Chairs

Board of Directors

Position	Name/Address	Contact Info
Chair	Frank Wolfe, NM7R PO Box 91, Nahcotta, WA, 98637	360-665-5292 chair@wwara.org
Vice Chair	Scott Honaker, N7SS 14014 89th Ave SE. Snohomish, WA 98296	425-330-5439 vice-chair@wwara.org
Secretary	Allen Hules, KE7HQQ 6408 Wheeler St, Snohomish, WA 98296	425-329-4079 secretary@wwara.org
Treasurer	Peter Dahl, WA7FUS 2948 217th Pl. SW, Brier, WA, 98036	425-778-3581 treasurer@wwara.org
Director #1	John Hays, K7VE PO Box 1223, Edmonds, Wa. 92020	206-801-0820 director1@wwara.org
Director #2	Kenny Richards, KU7M 12522 SE 75TH Place, Newcastle, WA, 98056	206-999-3958 director2@wwara.org
Director #3	Brian Hoyer, KG6GEU P.O. Box 564, Friday Harbor, WA 98250	360-378-1372 director3@wwara.org
Director #4	Doyle Wenzel, N7UJK 1704 W 7th St Aberdeen, WA. 98520	360-532-7470 director4@wwara.org

Standing Committees

Position	Name/Address	Contact Info
10 & 6 Meter Band Chair	Bill Balzarini KL7BB P.O. Box 1682, Auburn,WA. 98071-1682	206-400-1723 kl7bb@yahoo.com
2 Meter Band Chair	Mike Ping, N3KPU	253-224-7464 2mband@[illegible]
222 MHz Band Chair	Peter Dahl, WA7FUS 2948 217th Place SW, Brier, WA 98036	425-778-3581 pd_fus@mac.com
440 MHz Repeater Band Chair	Steve Szombathy, W7UDI P.O. Box 1736, Ellensburg, WA 98926	206-491-9682 w7udi@arrl.net
430 MHz Link Band Chair	Steve Szombathy, W7UDI P.O. Box 1736, Ellensburg, WA 98926	206-491-9682 w7udi@arrl.net
900 & 1200 MHz Band Chair	Scott Honaker, N7SS 14014 89th Ave SE. Snoho[illegible]96	425-330-5439 vice-chair@wwara.org
Webmaster	Jim Etzwiler, KD7BAT 19011 312th Ave NE, [illegible] 98019-7906	425-788-7887 webmaster@wwara.org
Database Manager	Tim Osburn, [illegible] Redmond, W[illegible]	206.812.6214 dataman@wwara.org
Technical Committee Member	Mark McAlvey, W7LMR 2204 116th Ave N.E., Lake Stevens, WA 98258	425-397-7990 w7lmr@frontier.com
Narrowband (analog & digital) Committee	Scott Honaker, N7SS 14014 89th Ave SE. Snohomish, WA 98296 Jim Elston, KP2X 2189 Robyn Dr, Ferndale, WA 98248	425-330-5439 vice-chair@wwara.org
Sergeant-at-Arms	Herman Entz, K7PAG 14260 Forman Rd SE, Olalla, WA. 98359	253-857-5946 herman@k7pag.com
Liaison with BCARCC	Brian Hoyer, KG6GEU P.O. Box 564, Friday Harbor, WA 98250	360-378-1372 director3@wwara.org

Adjacent-Area Coordinators

Position	Name/Address	Contact Info
BC, Canada - BCARCC	George Merchant, VE7CHU, Chief Coordinator	604-538-5888 coordinator@bcarcc.org
E. WA - IACC	Doug Rider, KC7JC 19410 E. Buckeye Ave., Spokane Valley, Wa. 99027-9584	509-922-5127 djr876@comcast.net
SW Idaho	Larry Smith, W7ZRQ 8106 Bolman St., Boise, ID. 83709	208-375-2205 [illegible]
Montana	Ken Kopp, K0PP Box 848, Anaconda, MT. 59711-0848	406-797-3340 k0pp@arrl.net
Oregon - ORRC	Ron Polluconi, KJ7IY PO Box 4402, Portland, OR. 97208-4402	503- 645-6206 rpolluconi@comcast.net

Confidential – For WWARA business use only.

Updated: 01/06/2012

Contact List

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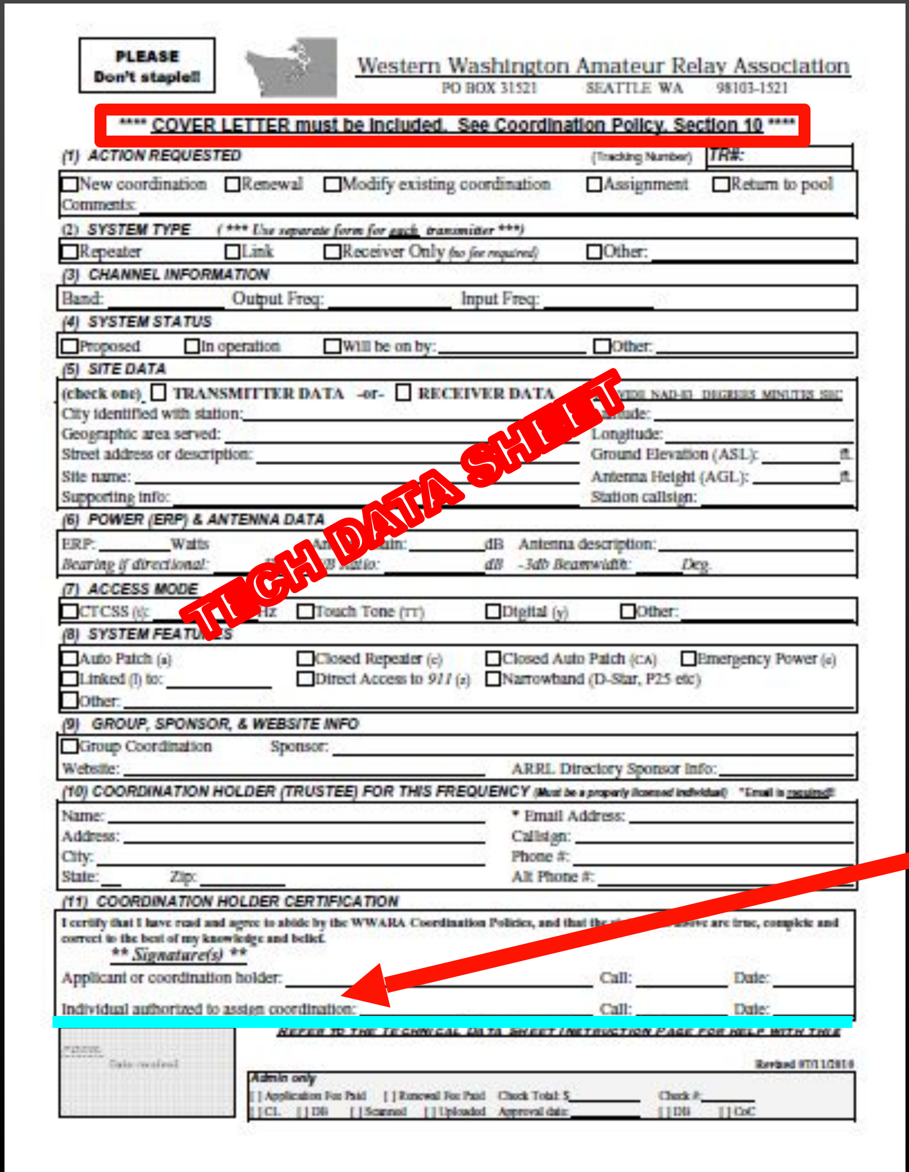
High Performance Repeaters



PLEASE Don't staple!!

Western Washington Amateur Relay Association
PO BOX 31521 SEATTLE WA 98103-1521

**** COVER LETTER must be included. See Coordination Policy, Section 10 ****

(1) ACTION REQUESTED (Tracking Number) TR#:

☐New coordination ☐Renewal ☐Modify existing coordination ☐Assignment ☐Return to pool
Comments:

(2) SYSTEM TYPE *(*** Use separate form for each transmitter ***)*

☐Repeater ☐Link ☐Receiver Only *(no fee required)* ☐Other:

(3) CHANNEL INFORMATION

Band: Output Freq: Input Freq:

(4) SYSTEM STATUS

☐Proposed ☐In operation ☐Will be on by: ☐Other:

(5) SITE DATA

(check one) ☐ **TRANSMITTER DATA -or- ☐ RECEIVER DATA** WGS NAD-83 DEGREES MINUTES SEC

City identified with station:
Geographic area served:
Street address or description:
Site name:
Supporting info:

itude:
Longitude:
Ground Elevation (ASL): ft.
Antenna Height (AGL): ft.
Station callsign:

(6) POWER (ERP) & ANTENNA DATA

ERP: Watts ain: dB Antenna description:
Bearing if directional: *B Ratio:* *dB* *-3db Beamwidth:* *Deg.*

(7) ACCESS MODE

☐CTCSS (t): Hz ☐Touch Tone (TT) ☐Digital (y) ☐Other:

(8) SYSTEM FEATURES

☐Auto Patch (a) ☐Closed Repeater (c) ☐Closed Auto Patch (CA) ☐Emergency Power (e)
☐Linked (l) to: ☐Direct Access to *911* (z) ☐Narrowband (D-Star, P25 etc)
☐Other:

(9) GROUP, SPONSOR, & WEBSITE INFO

☐Group Coordination Sponsor:
Website: ARRL Directory Sponsor Info:

(10) COORDINATION HOLDER (TRUSTEE) FOR THIS FREQUENCY (Must be a properly licensed individual) *Email is required!

Name:
Address:
City:
State: Zip:

* Email Address:
Callsign:
Phone #:
Alt Phone #:

(11) COORDINATION HOLDER CERTIFICATION

I certify that I have read and agree to abide by the WWARA Coordination Policies, and that the [illegible] above are true, complete and correct to the best of my knowledge and belief.

*** Signature(s) ***

Applicant or coordination holder: Call: Date:
Individual authorized to assign coordination: Call: Date:

REFER TO THE TECHNICAL DATA SHEET INSTRUCTION PAGE FOR HELP WITH THIS

Date received

Revised 07/11/2010

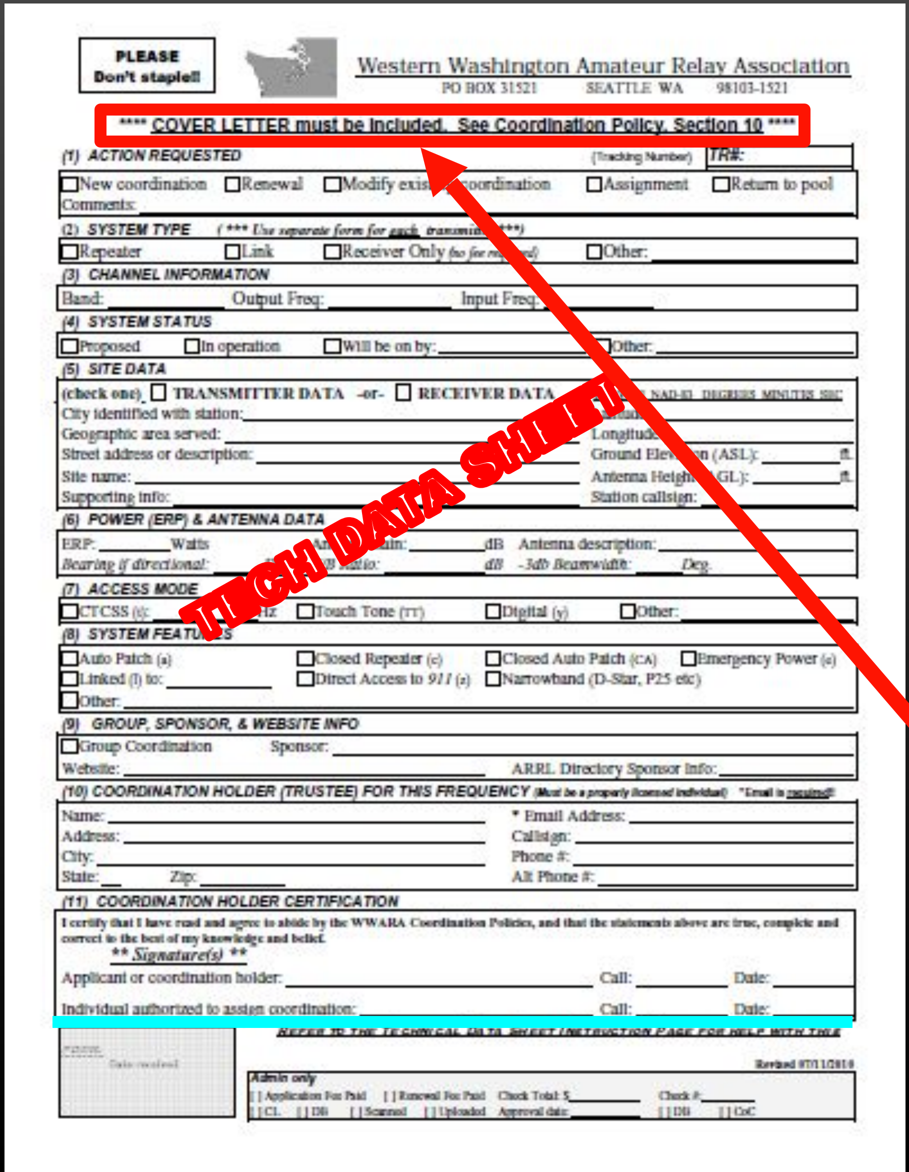
Admin only
[ ] Application Fee Paid [ ] Renewal Fee Paid Check Total: $ Check #:
[ ] CL [ ] DB [ ] Scanned [ ] Uploaded Approval date: [ ] DB [ ] CoC

TECH DATA SHEET

Most powerful Line in Obtaining a Repeater Freq. Pair

© 2012 KL7BB

High Performance Repeaters



PLEASE
Don't staple!!

Western Washington Amateur Relay Association
PO BOX 31521 SEATTLE WA 98103-1521

****** COVER LETTER must be included. See Coordination Policy, Section 10 ******

(1) ACTION REQUESTED (Tracking Number) *TR#:*

☐New coordination ☐Renewal ☐Modify existing coordination ☐Assignment ☐Return to pool
Comments:

(2) SYSTEM TYPE *(*** Use separate form for each transmitter ***)*

☐Repeater ☐Link ☐Receiver Only *(no fee required)* ☐Other:

(3) CHANNEL INFORMATION

Band: Output Freq: Input Freq:

(4) SYSTEM STATUS

☐Proposed ☐In operation ☐Will be on by: ☐Other:

(5) SITE DATA

(check one) ☐ TRANSMITTER DATA -or- ☐ RECEIVER DATA NAD-83 DEGREES MINUTES SEC
City identified with station: Latitude
Geographic area served: Longitude
Street address or description: Ground Elevation (ASL): ft.
Site name: Antenna Height (AGL): ft.
Supporting info: Station callsign:

(6) POWER (ERP) & ANTENNA DATA

ERP: Watts Antenna Gain: dB Antenna description:
Bearing if directional: F/B Ratio: dB -3db Beamwidth: Deg.

(7) ACCESS MODE

☐CTCSS (t): Hz ☐Touch Tone (TT) ☐Digital (y) ☐Other:

(8) SYSTEM FEATURES

☐Auto Patch (a) ☐Closed Repeater (c) ☐Closed Auto Patch (CA) ☐Emergency Power (e)
☐Linked (l) to: ☐Direct Access to *911* (z) ☐Narrowband (D-Star, P25 etc)
☐Other:

(9) GROUP, SPONSOR, & WEBSITE INFO

☐Group Coordination Sponsor:
Website: ARRL Directory Sponsor Info:

(10) COORDINATION HOLDER (TRUSTEE) FOR THIS FREQUENCY (Must be a properly licensed individual) *Email is required!

Name: * Email Address:
Address: Callsign:
City: Phone #:
State: Zip: Alt Phone #:

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[ ] Application Fee Paid [ ] Renewal Fee Paid Check Total: $ Check #:
[ ] CL [ ] DB [ ] Scanned [ ] Uploaded Approval date: [ ] DB [ ] CoC

TECH DATA SHEET

2nd Most powerful Line in Obtaining a Repeater Freq. Pair

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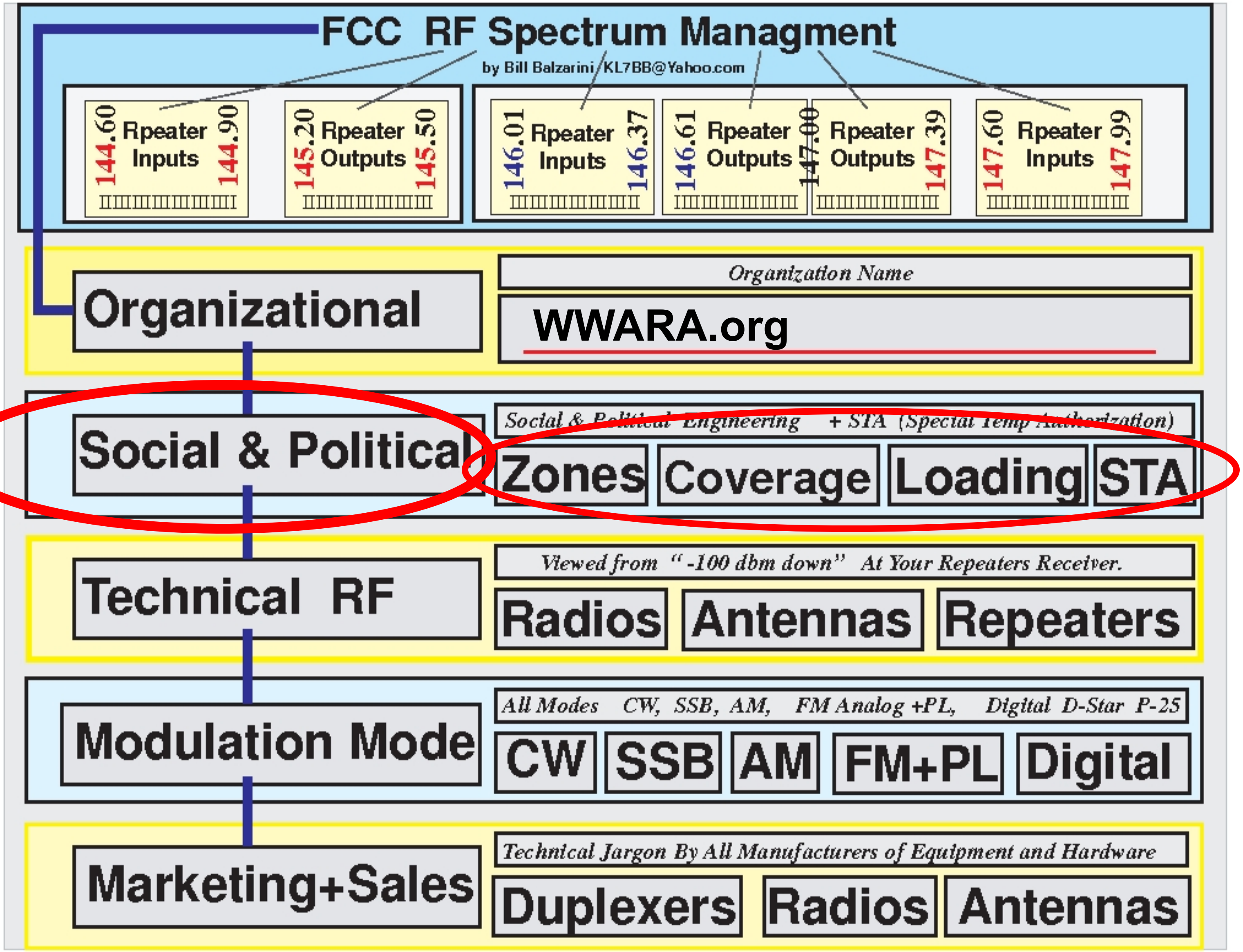
High Performance Repeaters



FCC RF Spectrum Managment

by Bill Balzarini KL7BB@Yahoo.com

144.60 Rpeater Inputs 144.90

145.20 Rpeater Outputs 145.50

146.01 Rpeater Inputs 146.37

146.61 Rpeater Outputs 147.00

147.00 Rpeater Outputs 147.39

147.60 Rpeater Inputs 147.99

Organizational

Organization Name

WWARA.org

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios | Antennas | Repeaters

Modulation Mode

All Modes CW, SSB, AM, FM Analog +PL, Digital D-Star P-25

CW | SSB | AM | FM+PL | Digital

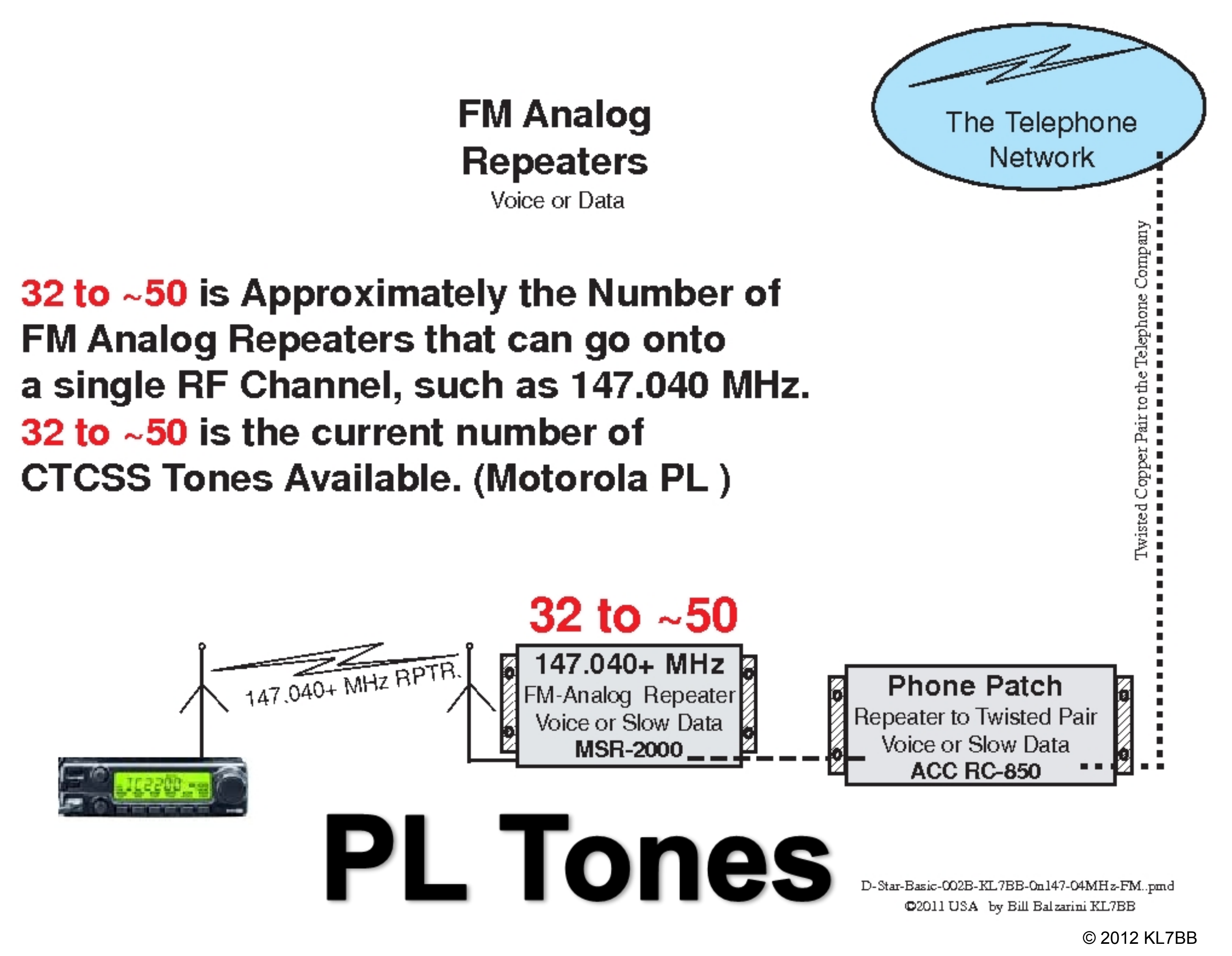
Marketing+Sales

Technical Jargon By All Manufacturers of Equipment and Hardware

Duplexers | Radios | Antennas

© 2012 KL7BB

High Performance Repeaters



FM Analog Repeaters

Voice or Data

32 to ~50 is Approximately the Number of FM Analog Repeaters that can go onto a single RF Channel, such as 147.040 MHz.
32 to ~50 is the current number of CTCSS Tones Available. (Motorola PL)

The Telephone Network

Twisted Copper Pair to the Telephone Company

32 to ~50

147.040+ MHz RPTR.

147.040+ MHz
FM-Analog Repeater
Voice or Slow Data
MSR-2000

Phone Patch
Repeater to Twisted Pair
Voice or Slow Data
ACC RC-850

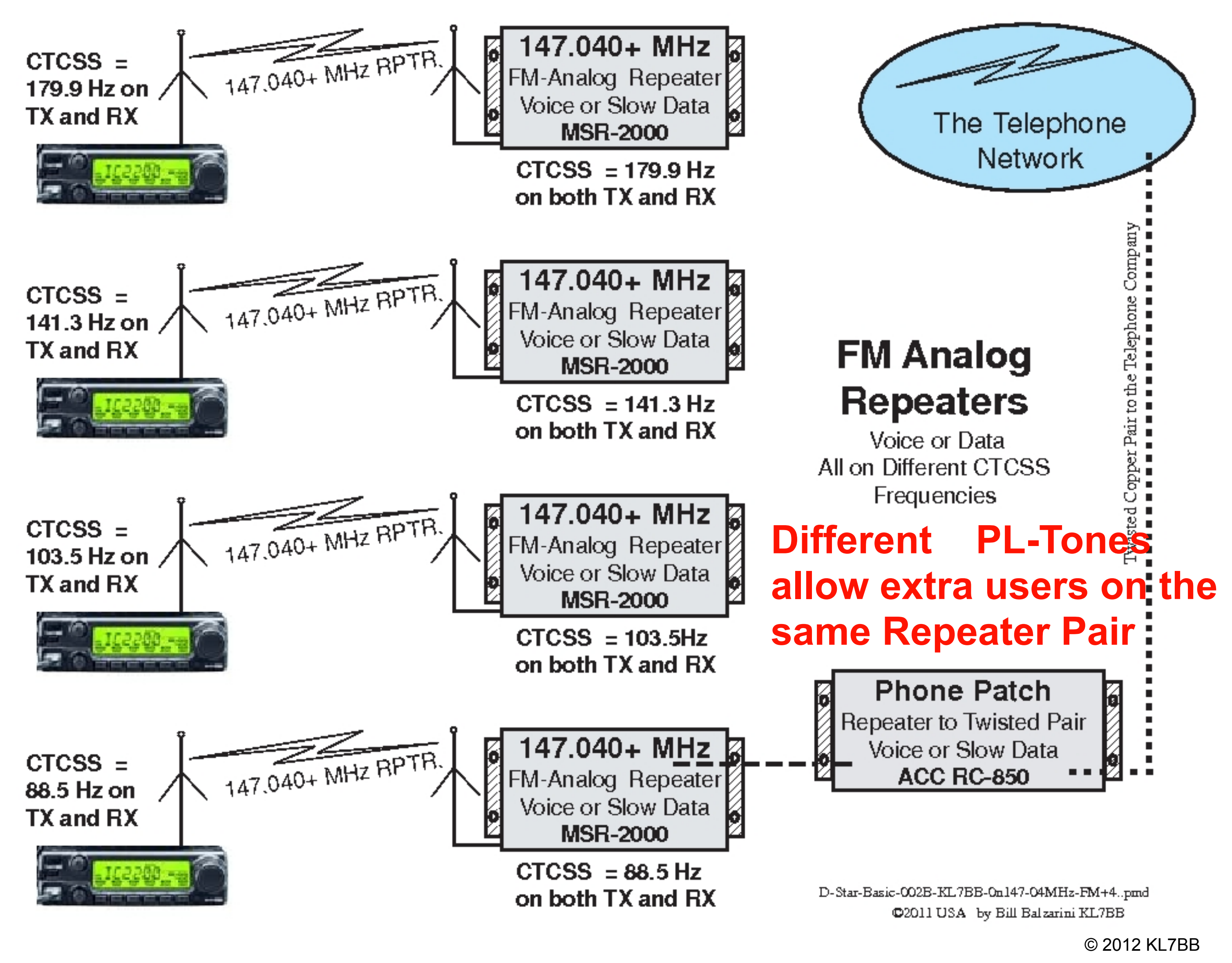
PL Tones

D-Star-Basic-002B-KL7BB-0n147-04MHz-FM..pmd

©2011 USA by Bill Balzarini KL7BB

© 2012 KL7BB

High Performance Repeaters



FM Analog Repeaters

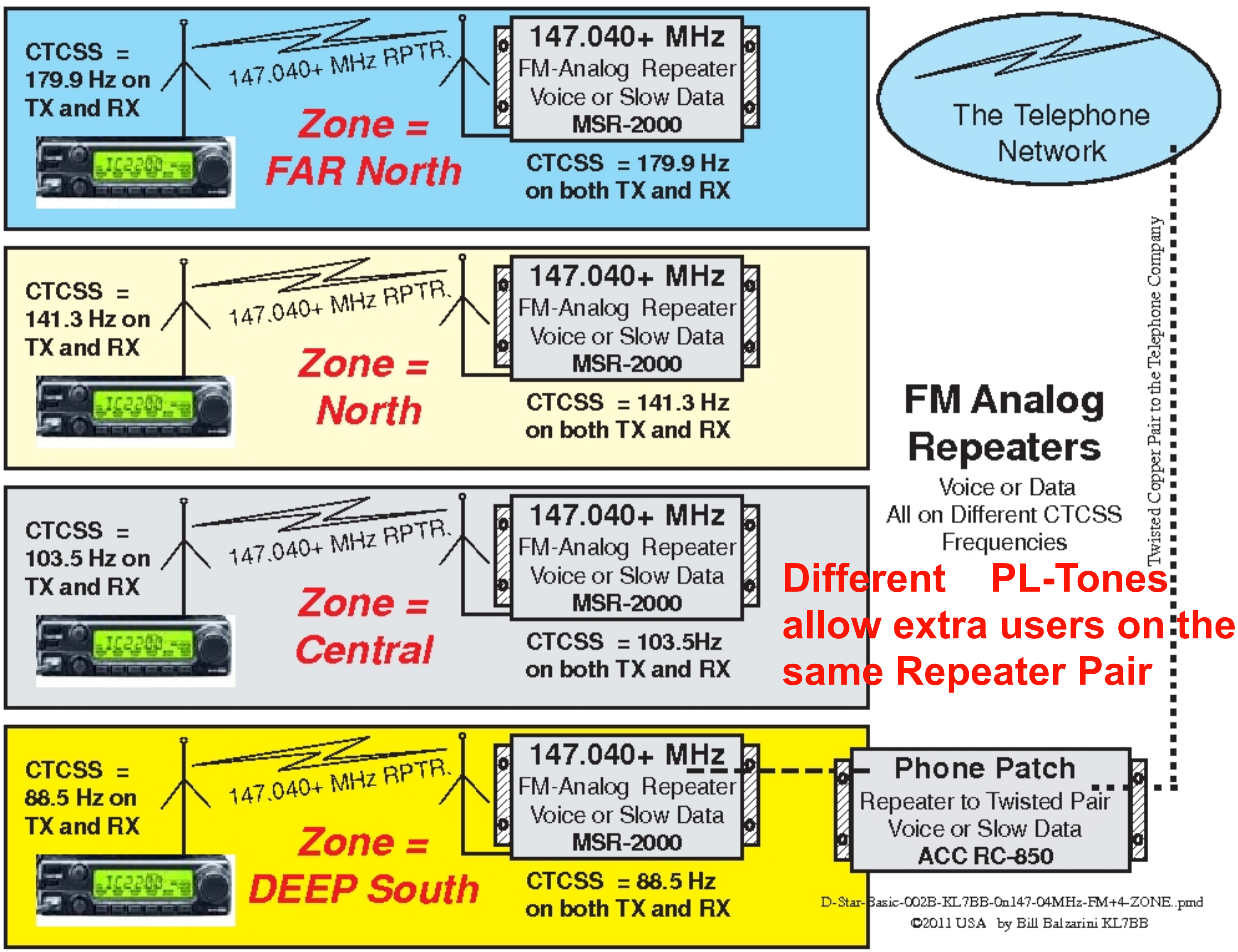
Voice or Data
All on Different CTCSS Frequencies

Different PL-Tones allow extra users on the same Repeater Pair

D-Star-Basic-002B-KL7BB-On147-04MHz-FM+4..pmd
©2011 USA by Bill Balzarini KL7BB

© 2012 KL7BB

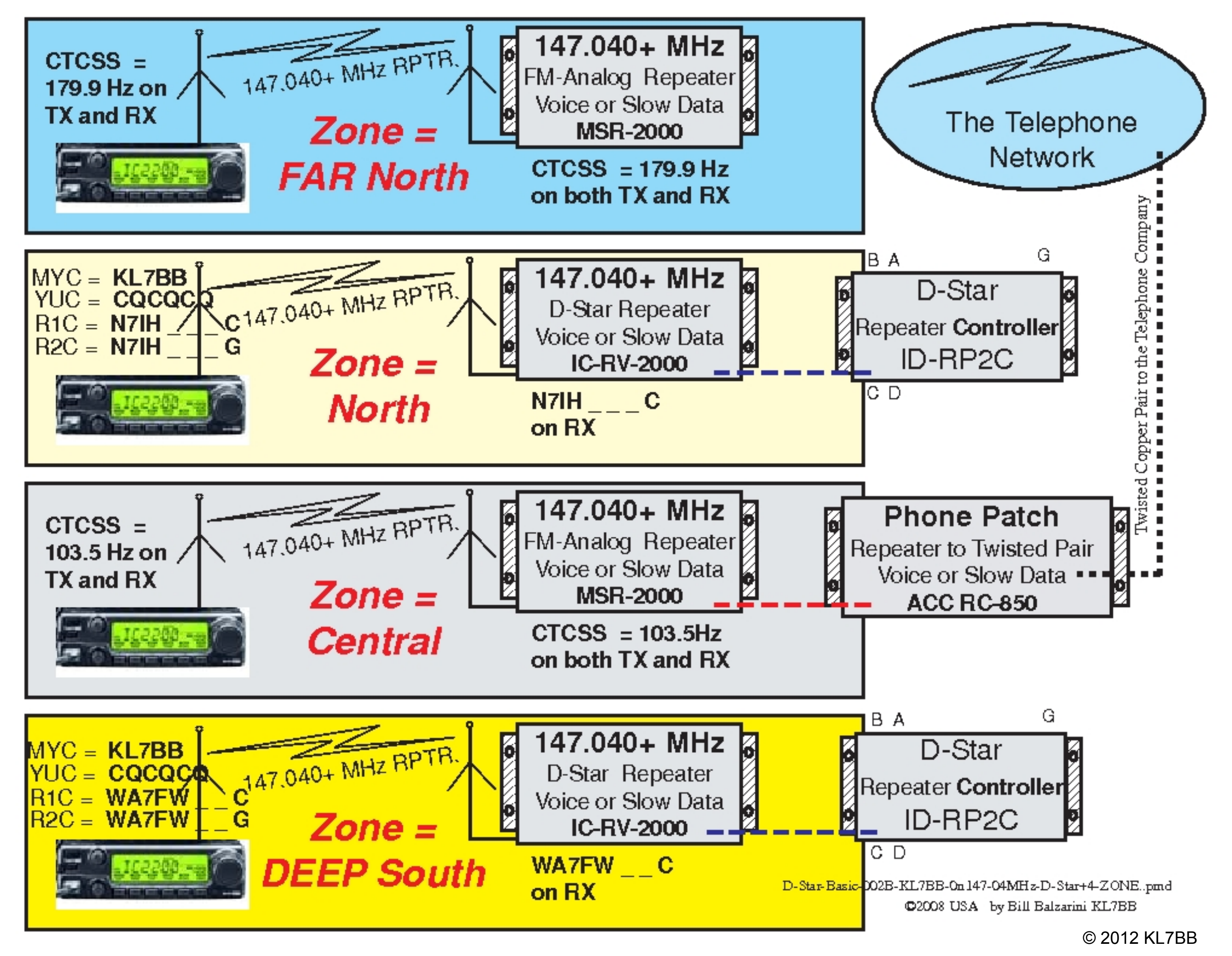
High Performance Repeaters



Different PL-Tones allow extra users on the same Repeater Pair

© 2012 KL7BB

High Performance Repeaters



Only works with very LOW elevat sites

Repeater Sites

© 2012 KL7BB

Repeater Sites ***for WA7FW***

- 146.76 - MHz FM Analog +Phone
- 147.04 + MHz FM Analog
- 442.95 + MHz FM Analog
- Simplex Direct (Talk-Around)(No +/-)

© 2012 KL7BB

Repeater Sites and Your HT

- → 146.76- MHz FM Analog +Phone Patch (+PL Tones)
- ↔ 146.76 Simplex (+PL Tones) (Everyone else is still on PL)
- ← 146.16+ Reverse Repeater (+PL Tones)

- → 147.04+ MHz FM Analog (+PL Tones)
- ↔ 147.04 Simplex (+PL Tones) (Everyone else is still on PL)
- ← 147.64- Reverse Repeater (+PL Tones)

- → 442.95+ MHz FM Analog (+PL Tone ON ur TX only)
- ↔ 442.95 Simplex (no PL Tones)
- ← 447.95- Reverse Repeater (No PL Tone)

- ↔ Simplex Direct (Talk-Around) (No + or -)

© 2012 KL7BB

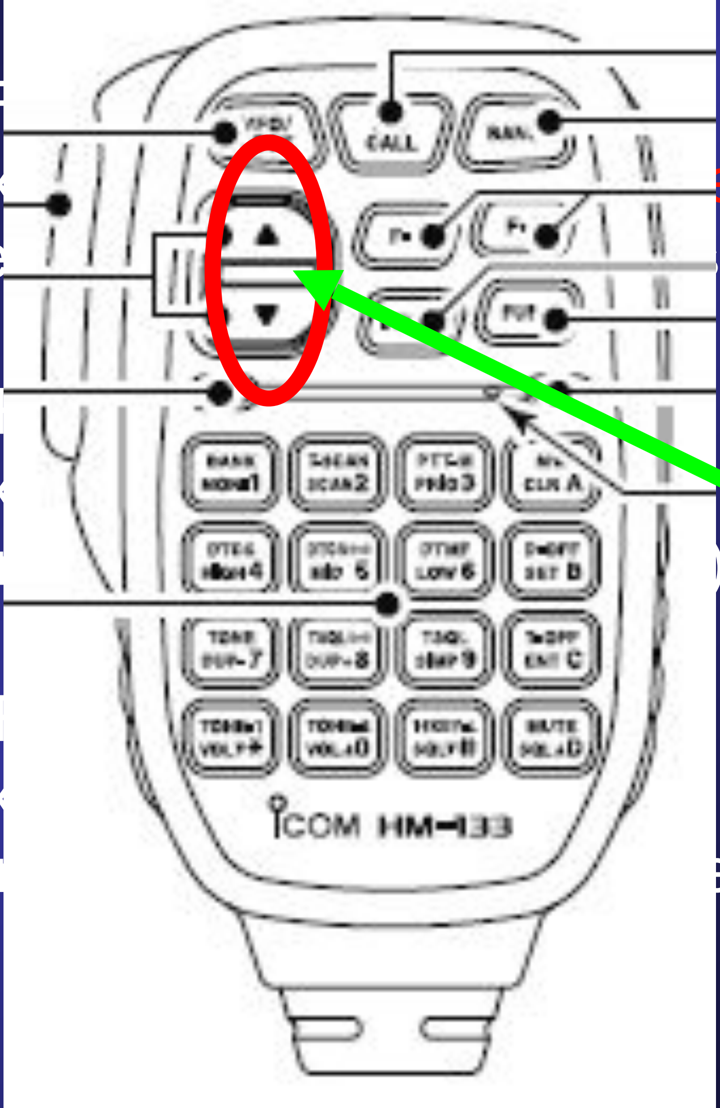
Repeater Sites and Your HT

- 146.76- MHz F (+PL Tones)
- 146.76 Simplex else is still on PL)
- 146.16+ Reve)

- 147.04+ MHz I
- 147.04 Simplex else is still on PL)
- 147.64- Rever)

- 442.95+ MHz I ur TX c
- 442.95 Simplex
- 447.95- Rever e)

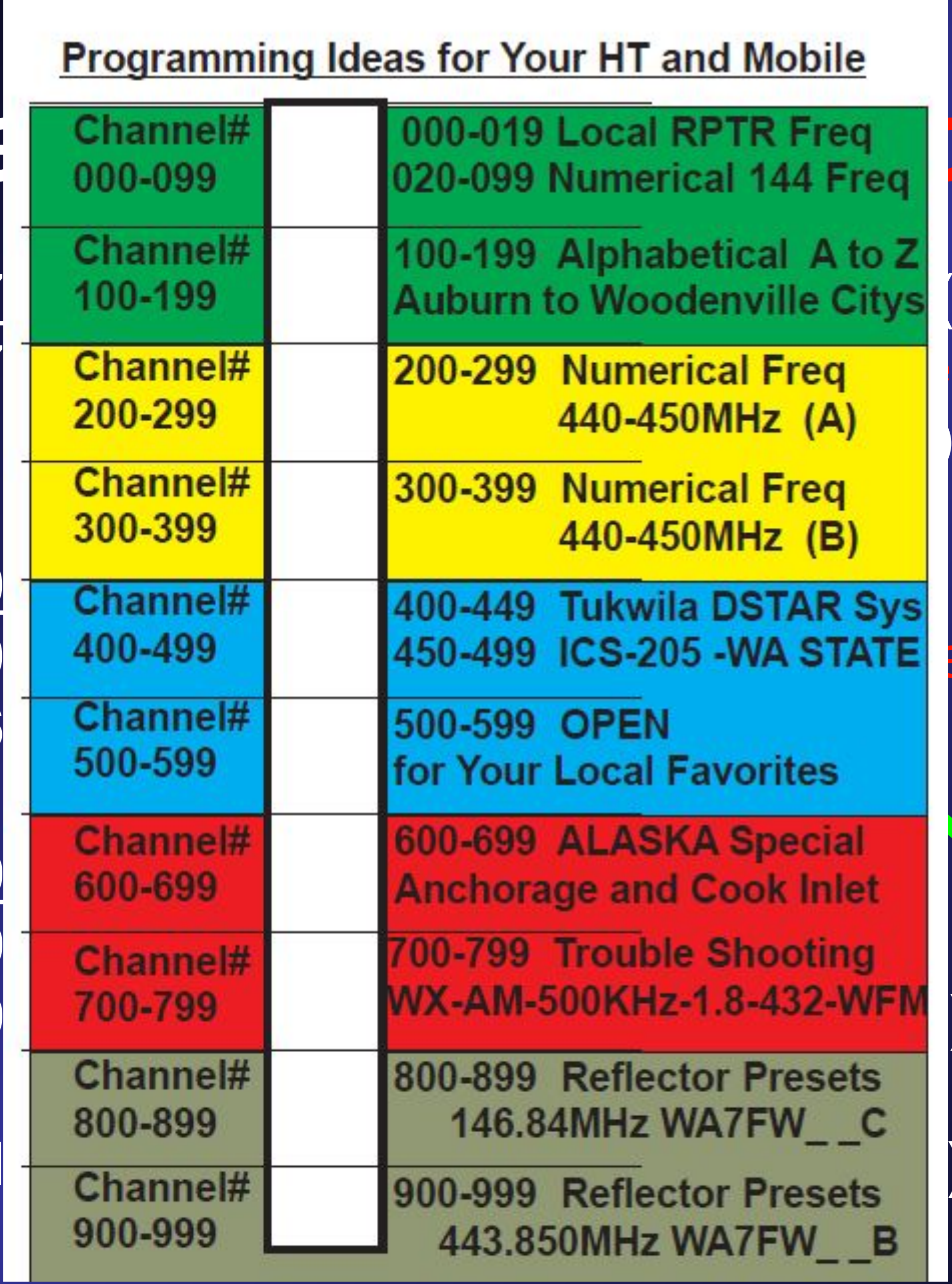
- Simplex Direct)



UP & Down. Channel Change.

While doing any other Task, Like Driving

Repe… our HT



Programming Ideas for Your HT and Mobile

Channel# 000-099		000-019 Local RPTR Freq 020-099 Numerical 144 Freq
Channel# 100-199		100-199 Alphabetical A to Z Auburn to Woodenville Citys
Channel# 200-299		200-299 Numerical Freq 440-450MHz (A)
Channel# 300-399		300-399 Numerical Freq 440-450MHz (B)
Channel# 400-499		400-449 Tukwila DSTAR Sys 450-499 ICS-205 -WA STATE
Channel# 500-599		500-599 OPEN for Your Local Favorites
Channel# 600-699		600-699 ALASKA Special Anchorage and Cook Inlet
Channel# 700-799		700-799 Trouble Shooting WX-AM-500KHz-1.8-432-WFM
Channel# 800-899		800-899 Reflector Presets 146.84MHz WA7FW_ _C
Channel# 900-999		900-999 Reflector Presets 443.850MHz WA7FW_ _B

Channel Pre Programming for UP & Down.

While doing any other Task, Like Driving

- 146.7 … (+
- 146.7 … ls
- 146.1 …)

- 147.0
- 147.0 … els
- 147.6

- 442.9 … ur TX only)
- 442.9
- 447.9 …)

- Simpl …)

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Repeaters VHF & UHF

The FWARC Repeaters Help us service the Greater Federal Way Area.

- Locally most VHF or UHF analog FM repeaters might cover area locations out to a range of 25 to 50+ miles.

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Repeaters VHF & UHF

Our WA7FW repeaters are able to remain operational 24x7 in their current sites and here are some following examples.

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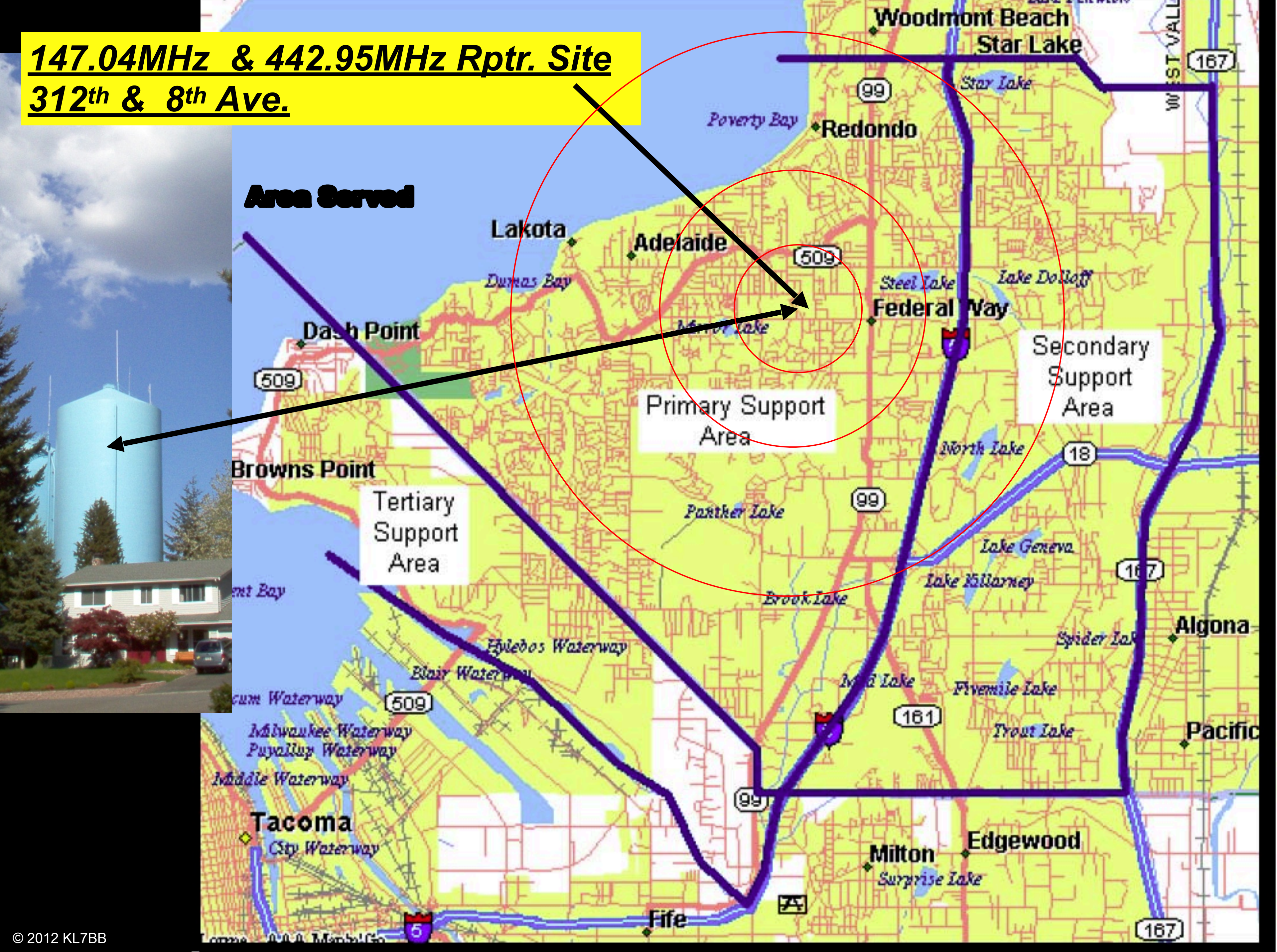
147.04MHz & 442.95MHz Rptr. Site
312th & 8th Ave.



Area Served

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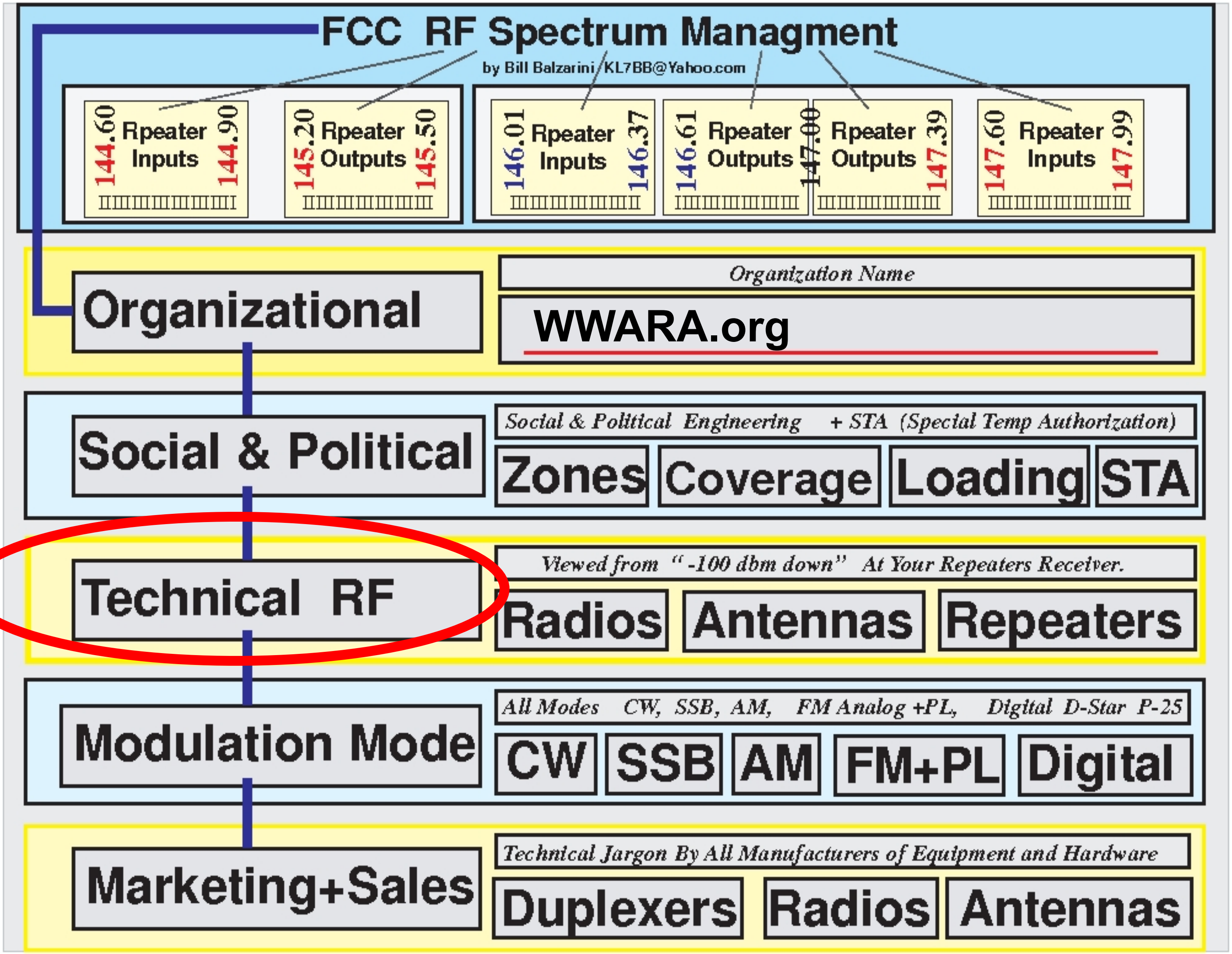
High Performance Repeaters



FCC RF Spectrum Managment

by Bill Balzarini/KL7BB@Yahoo.com

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145.20 Rpeater Outputs 145.50

146.01 Rpeater Inputs 146.37

146.61 Rpeater Outputs 147.00

Rpeater Outputs 147.39

147.60 Rpeater Inputs 147.99

Organizational

Organization Name

WWARA.org

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones | Coverage | Loading | STA

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios | Antennas | Repeaters

Modulation Mode

All Modes CW, SSB, AM, FM Analog +PL, Digital D-Star P-25

CW | SSB | AM | FM+PL | Digital

Marketing+Sales

Technical Jargon By All Manufacturers of Equipment and Hardware

Duplexers | Radios | Antennas

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High Performance Repeaters

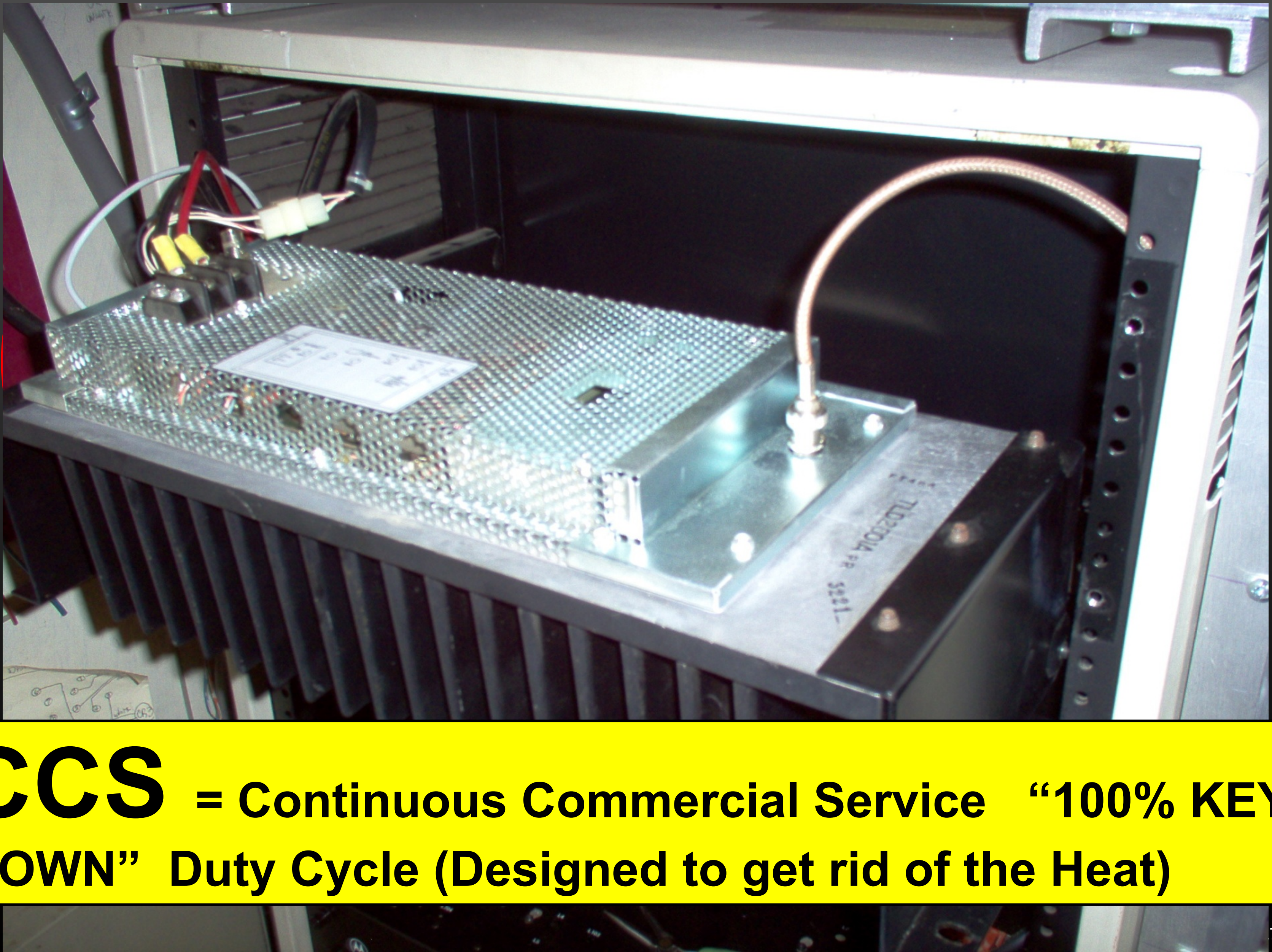
ICS = Intermittent Commercial Service

10% TX 90% RX Longer time to get rid of the Heat Build-up in TX Final Amp and Power Supplies.

CCS = Continuous Commercial Service "100% KEY-DOWN" Duty Cycle (Designed to get rid of the Heat)

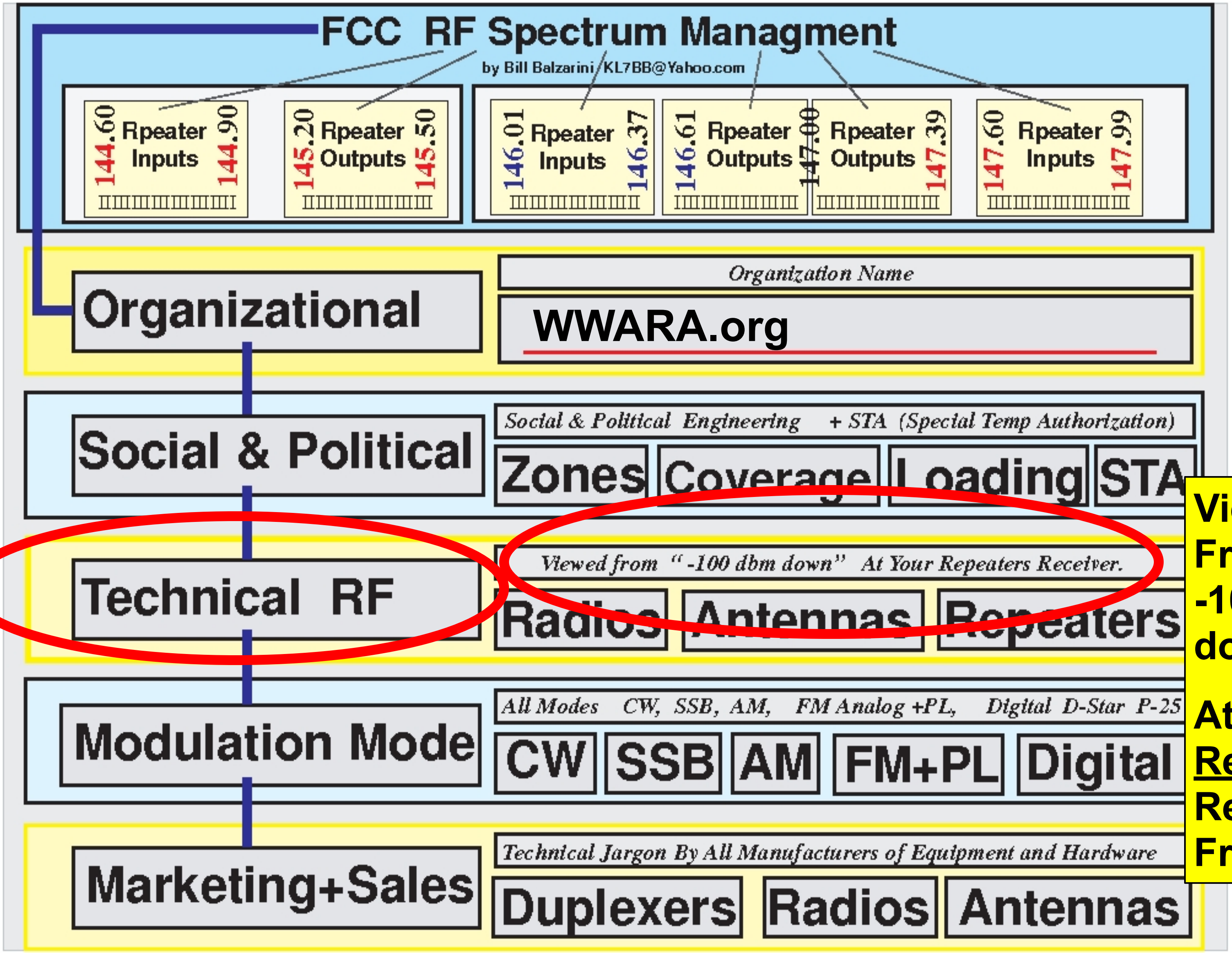
© 2012 KL7BB

High Performance Repeaters



CCS **= Continuous Commercial Service “100% KEY-DOWN” Duty Cycle (Designed to get rid of the Heat)**

High Performance Repeaters



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Organizational

Organization Name

WWARA.org

Social & Political

Social & Political Engineering + STA (Special Temp Authorization)

Zones **Coverage** **Loading** **STA**

Technical RF

Viewed from "-100 dbm down" At Your Repeaters Receiver.

Radios **Antennas** **Repeaters**

Modulation Mode

All Modes CW, SSB, AM, FM Analog +PL, Digital D-Star P-25

CW **SSB** **AM** **FM+PL** **Digital**

Marketing+Sales

Technical Jargon By All Manufacturers of Equipment and Hardware

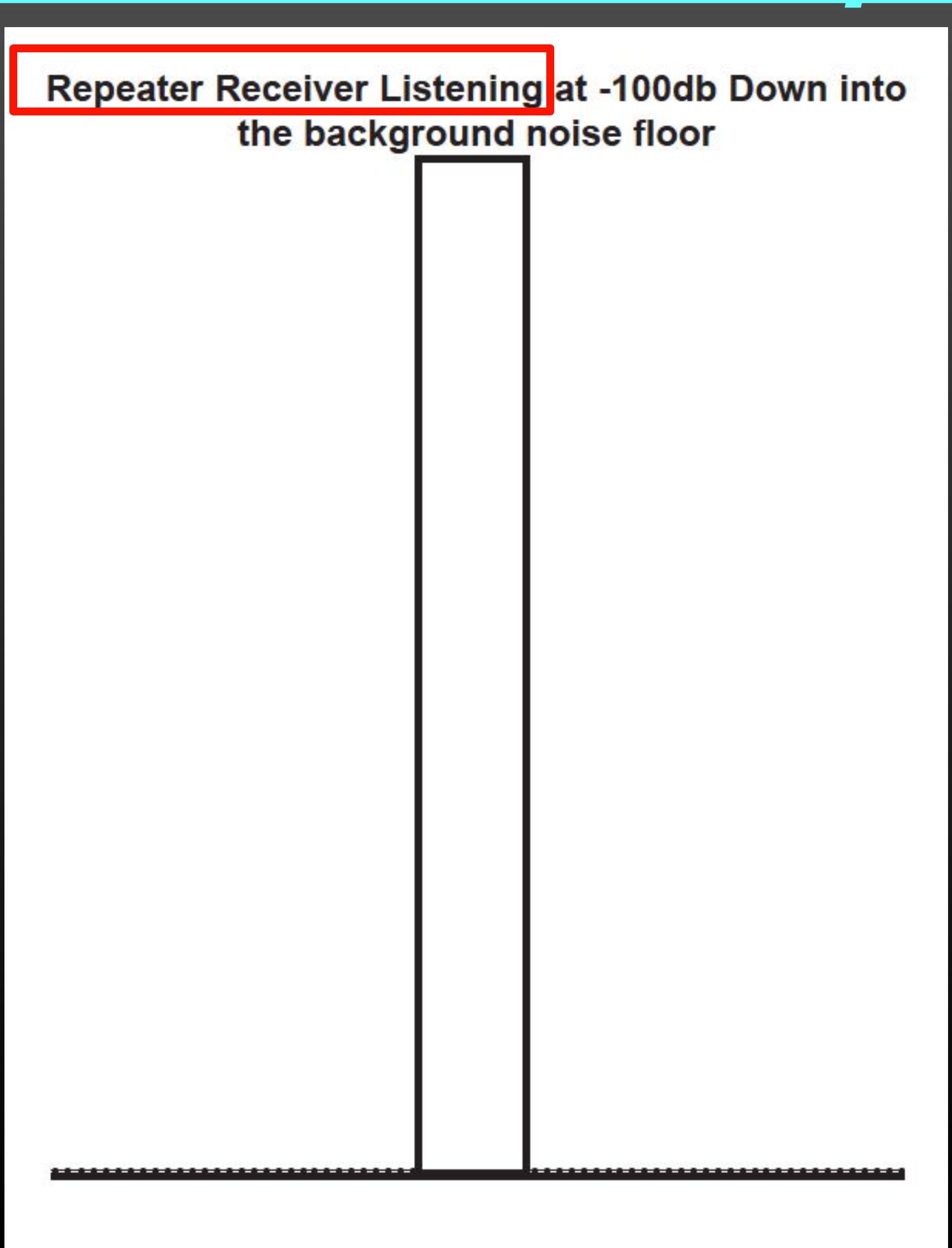
Duplexers **Radios** **Antennas**

Viewed From -100db down.

At the Repeater Receiver Front End

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

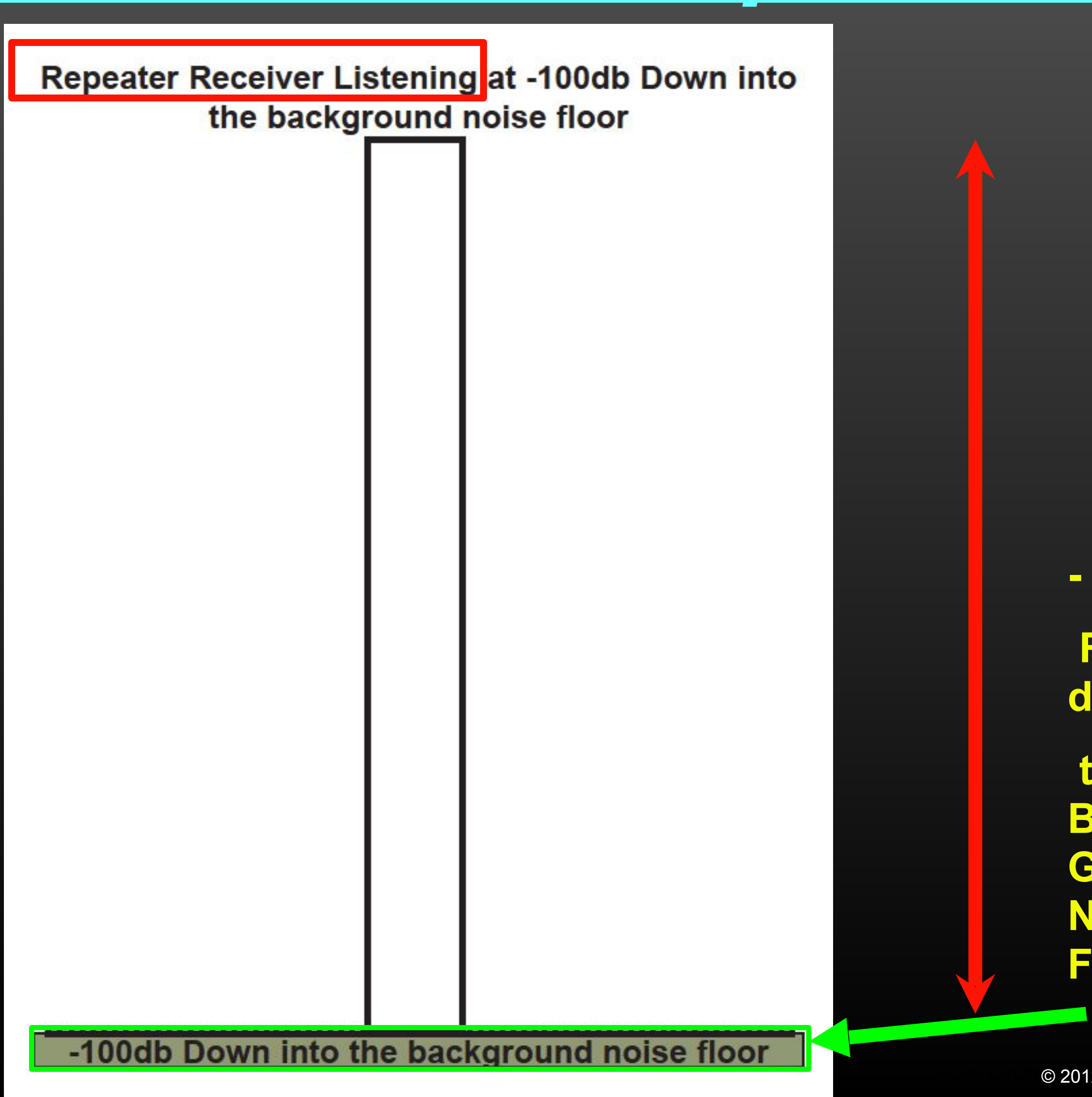
- 100db

Range of system duplexers

TxRx Brand

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

-100db Down into the background noise floor

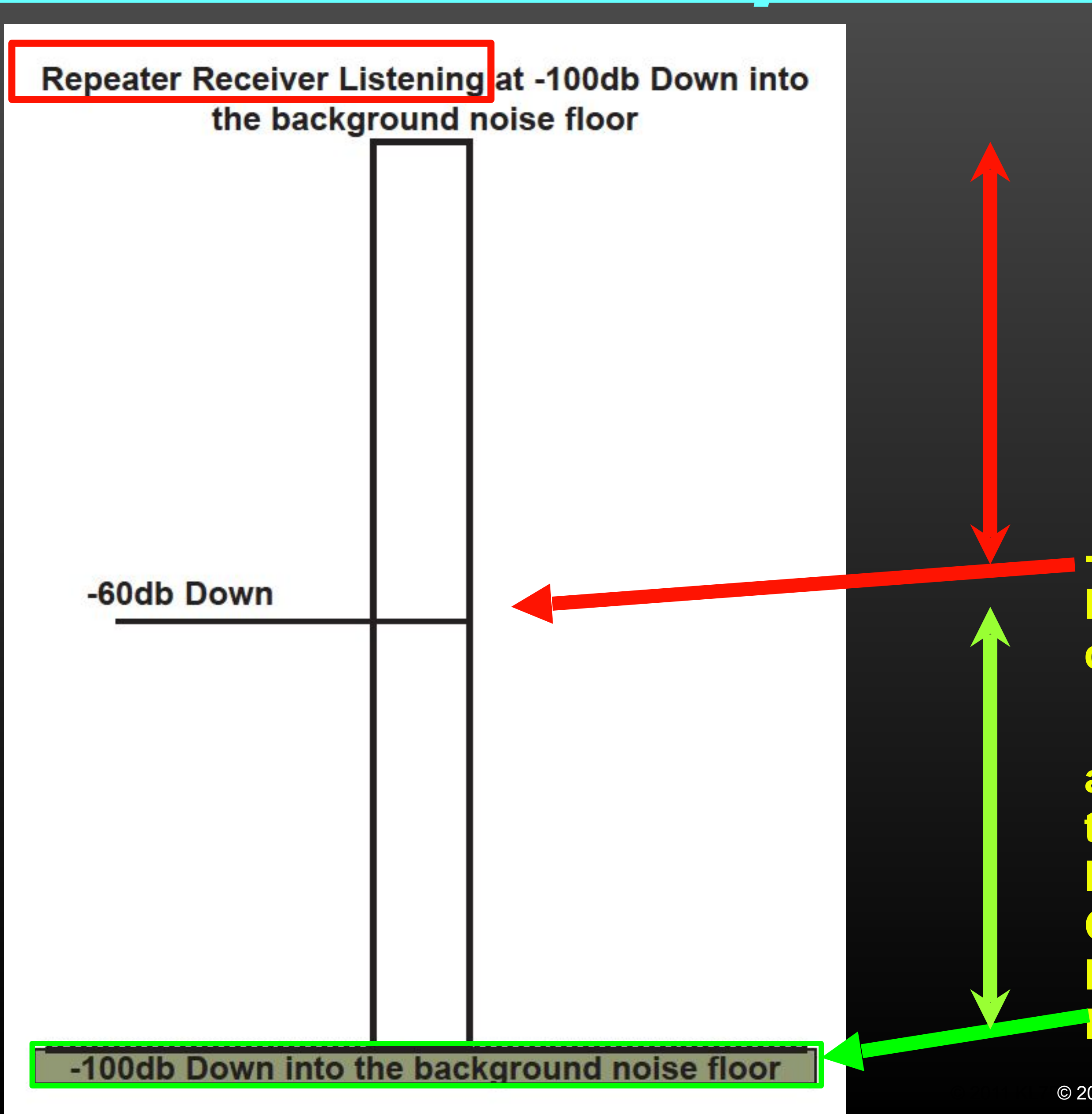
- 100db

Range down,

to the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

-60db Down

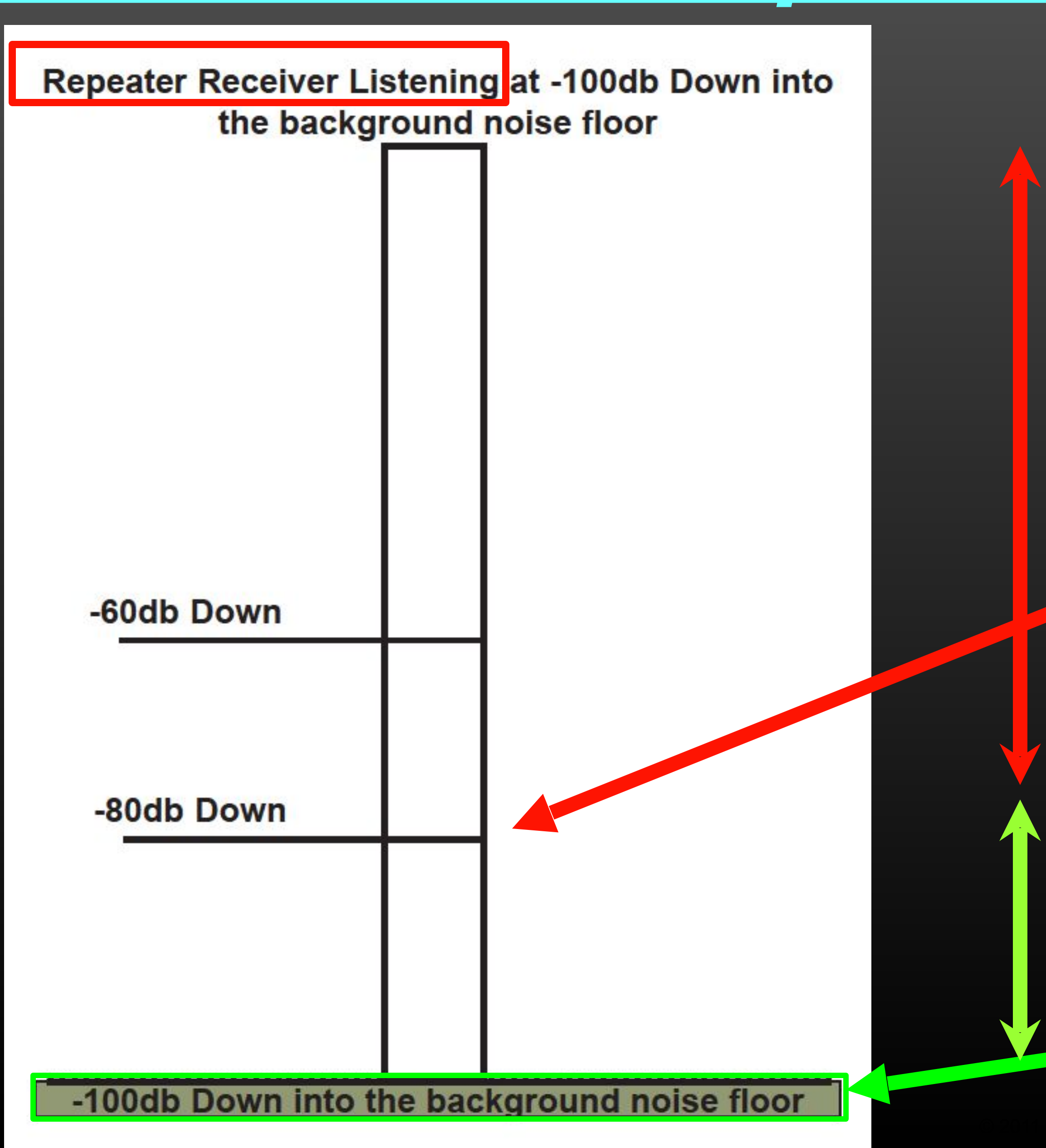
-100db Down into the background noise floor

- 60db Range down.

40db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters

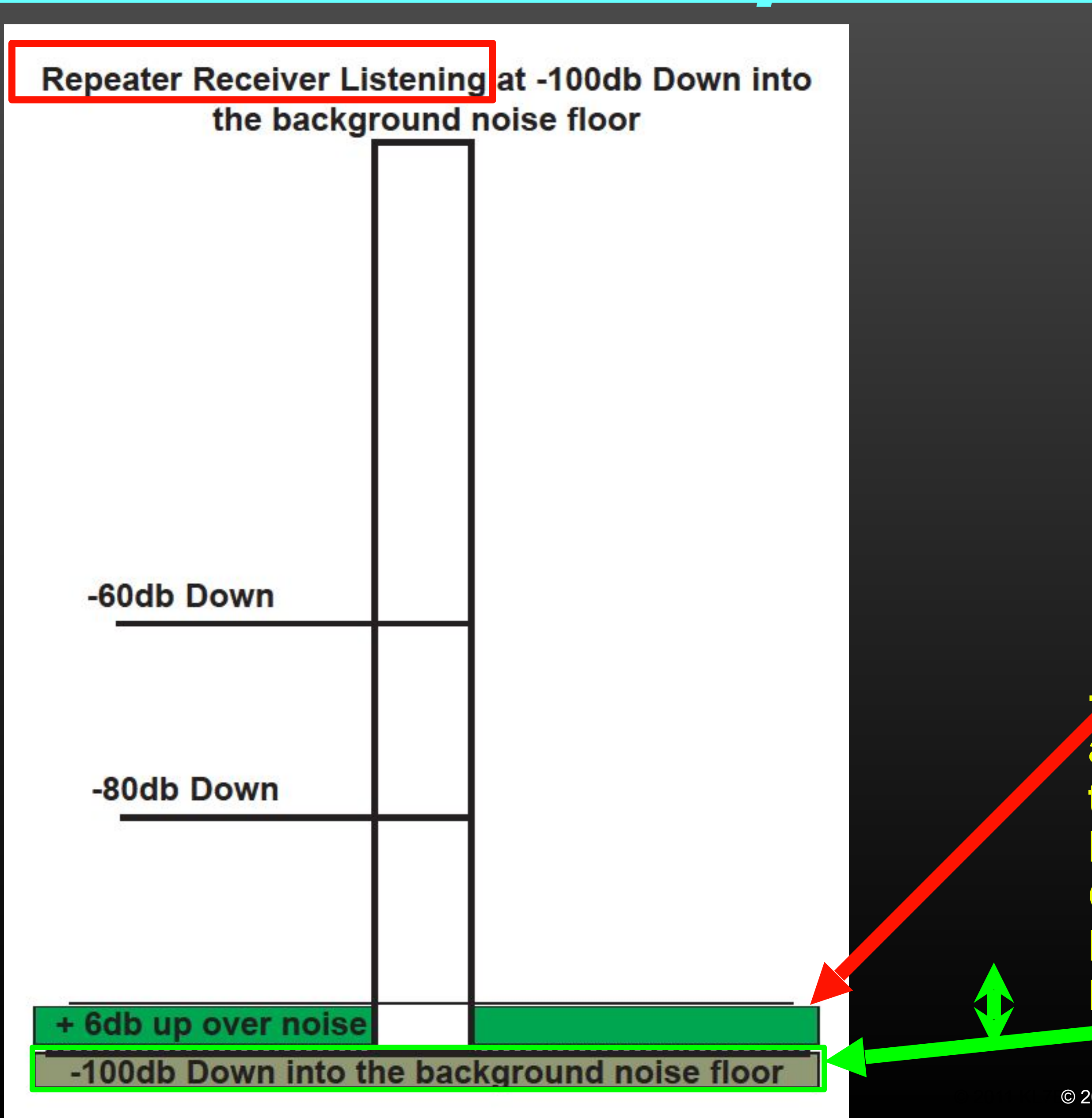

Repeater Receiver Listening at -100db Down into the background noise floor
-60db Down
-80db Down
-100db Down into the background noise floor

- 80db Range down.

20db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

-60db Down

-80db Down

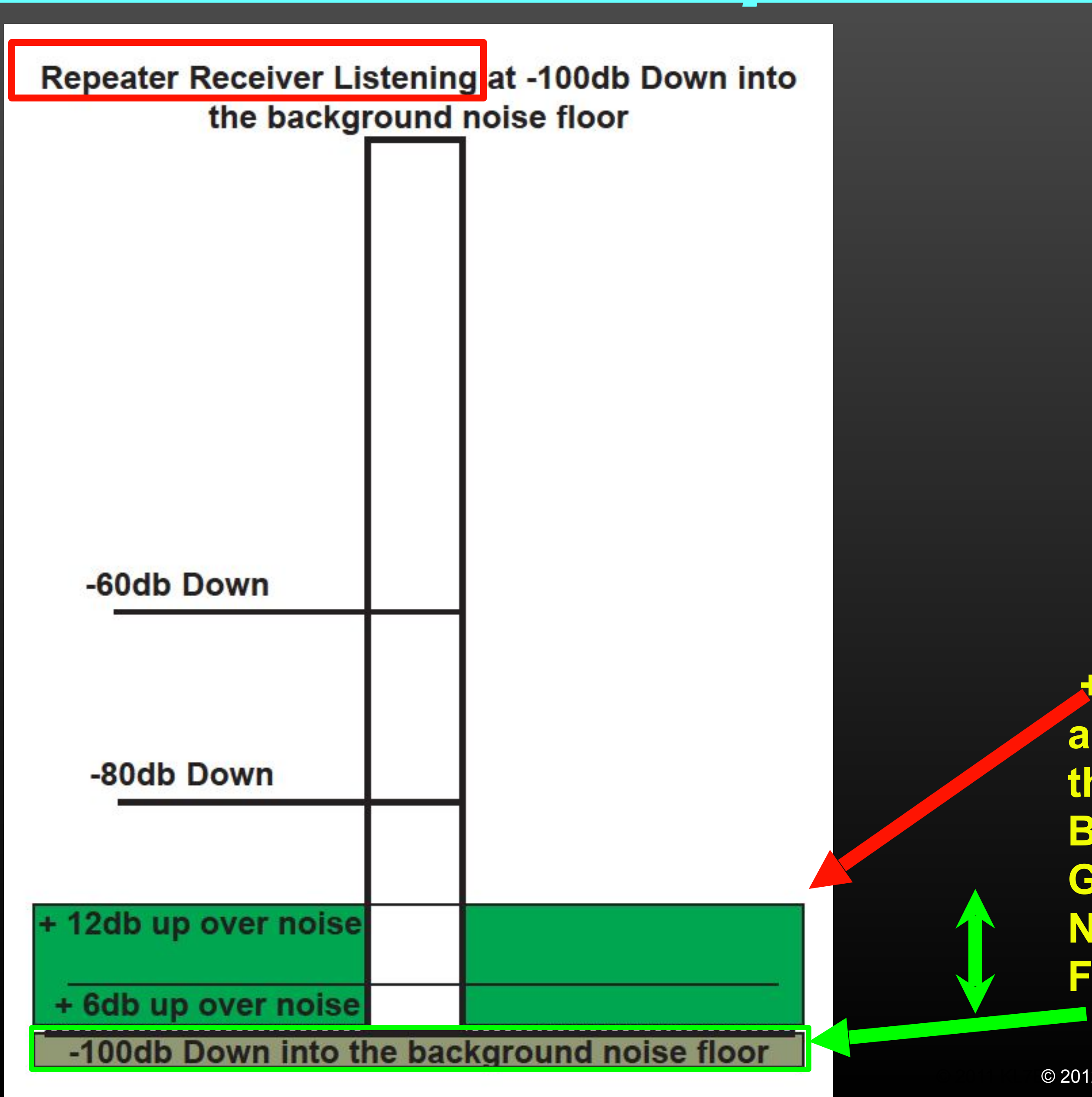
+ 6db up over noise

-100db Down into the background noise floor

+6db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

-60db Down

-80db Down

+ 12db up over noise

+ 6db up over noise

-100db Down into the background noise floor

+12db above the Back Ground Noise Floor

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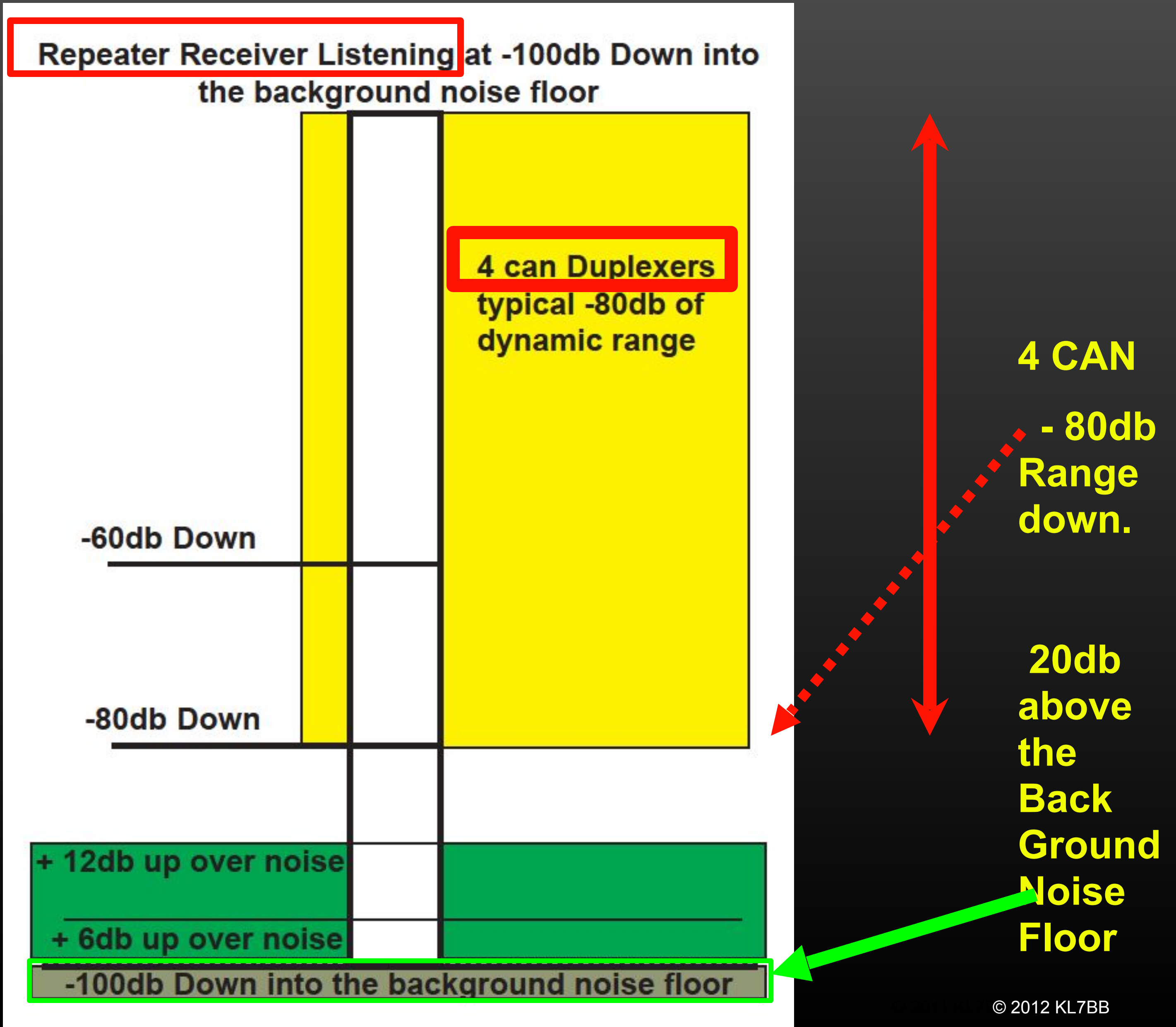
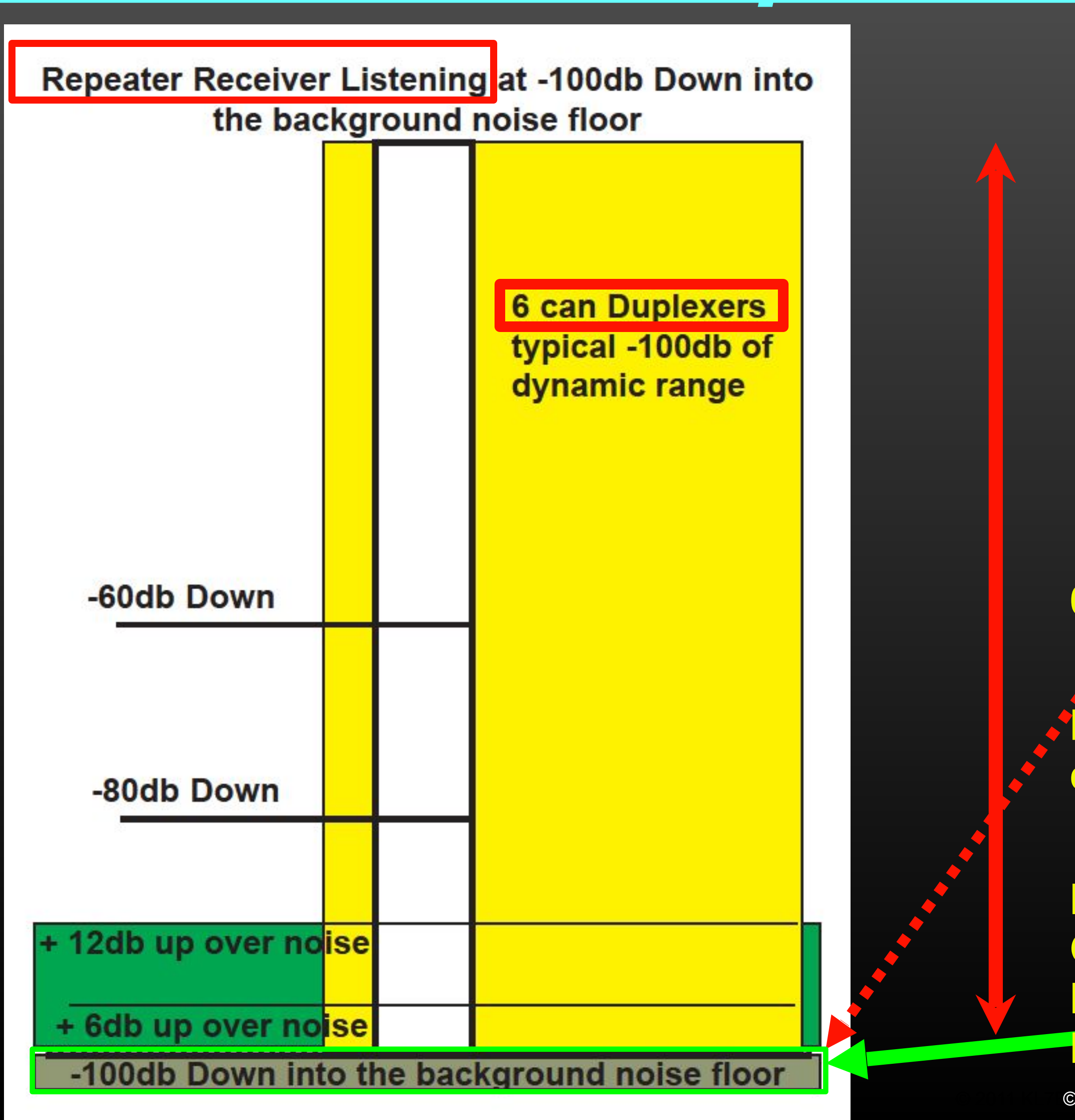
High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor
4 can Duplexers typical -80db of dynamic range
-60db Down
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor
4 CAN
- 80db Range down.
20db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

6 can Duplexers typical -100db of dynamic range

-60db Down

-80db Down

+ 12db up over noise

+ 6db up over noise

-100db Down into the background noise floor

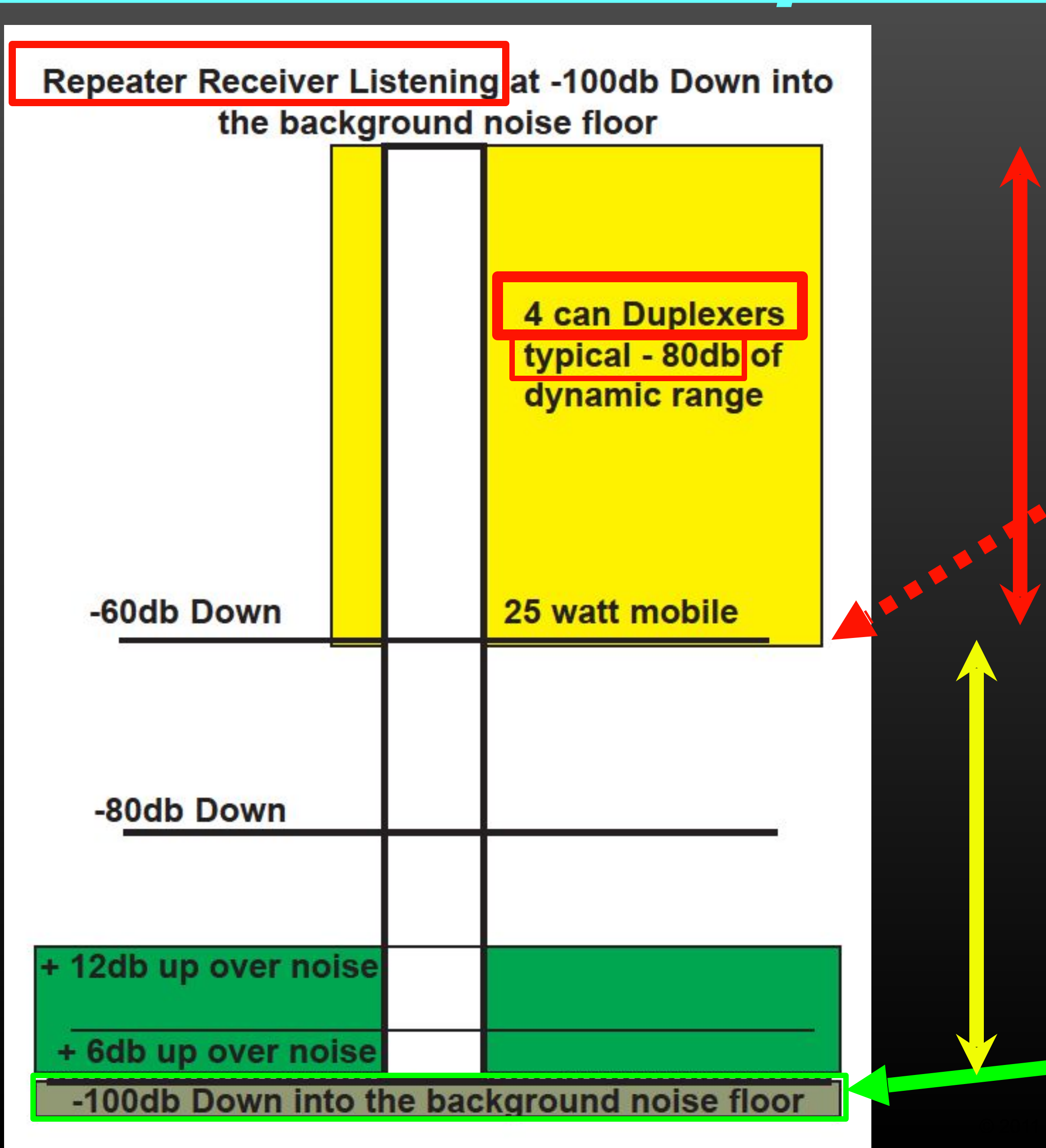
6 CAN

- 100db Range down.

To the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters

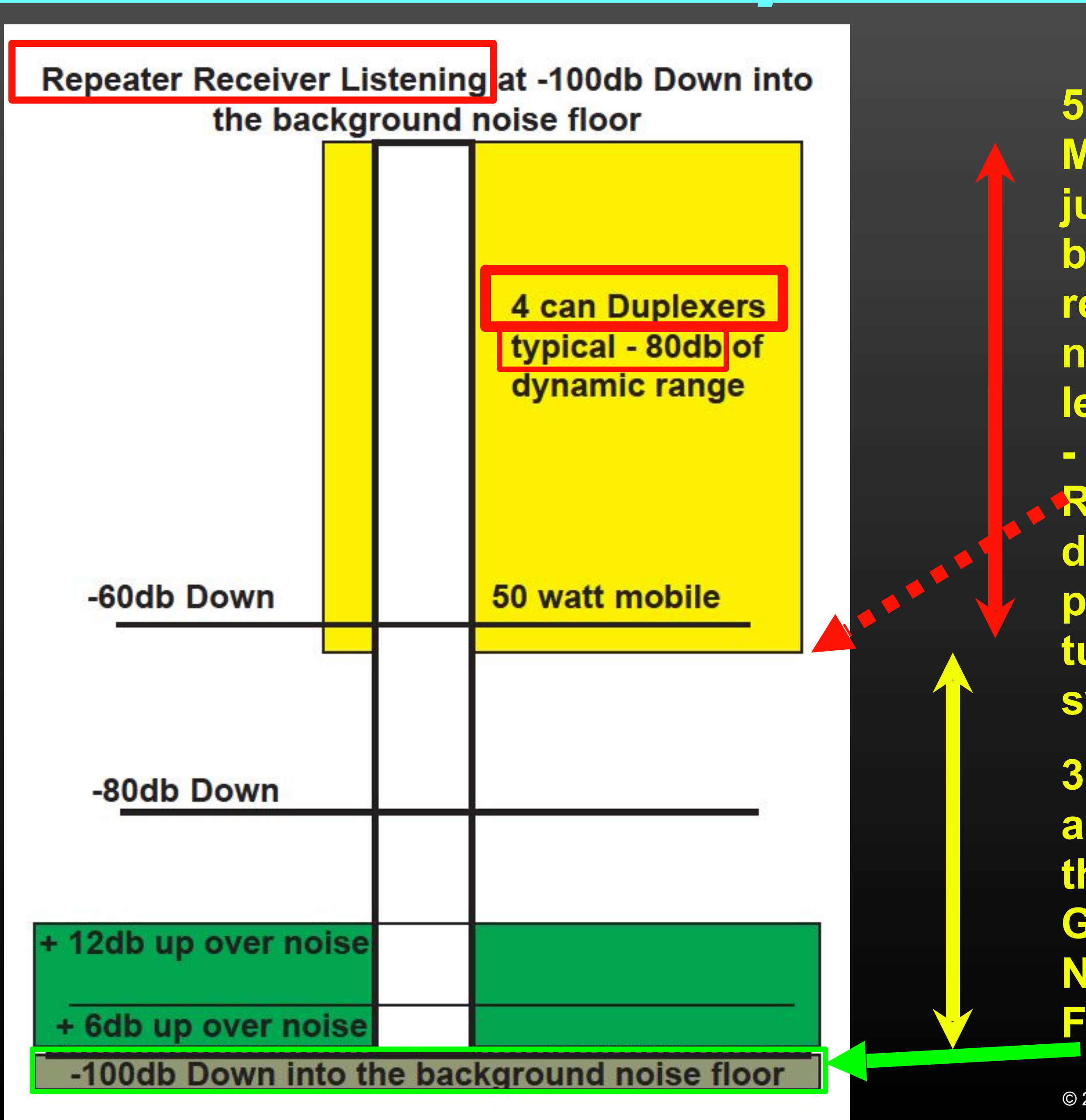

Repeater Receiver Listening at -100db Down into the background noise floor
4 can Duplexers typical - 80db of dynamic range
-60db Down
25 watt mobile
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

25 Watt Mobile, just at repeater noise level - 60db Range down on poorly tuned system

40db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters

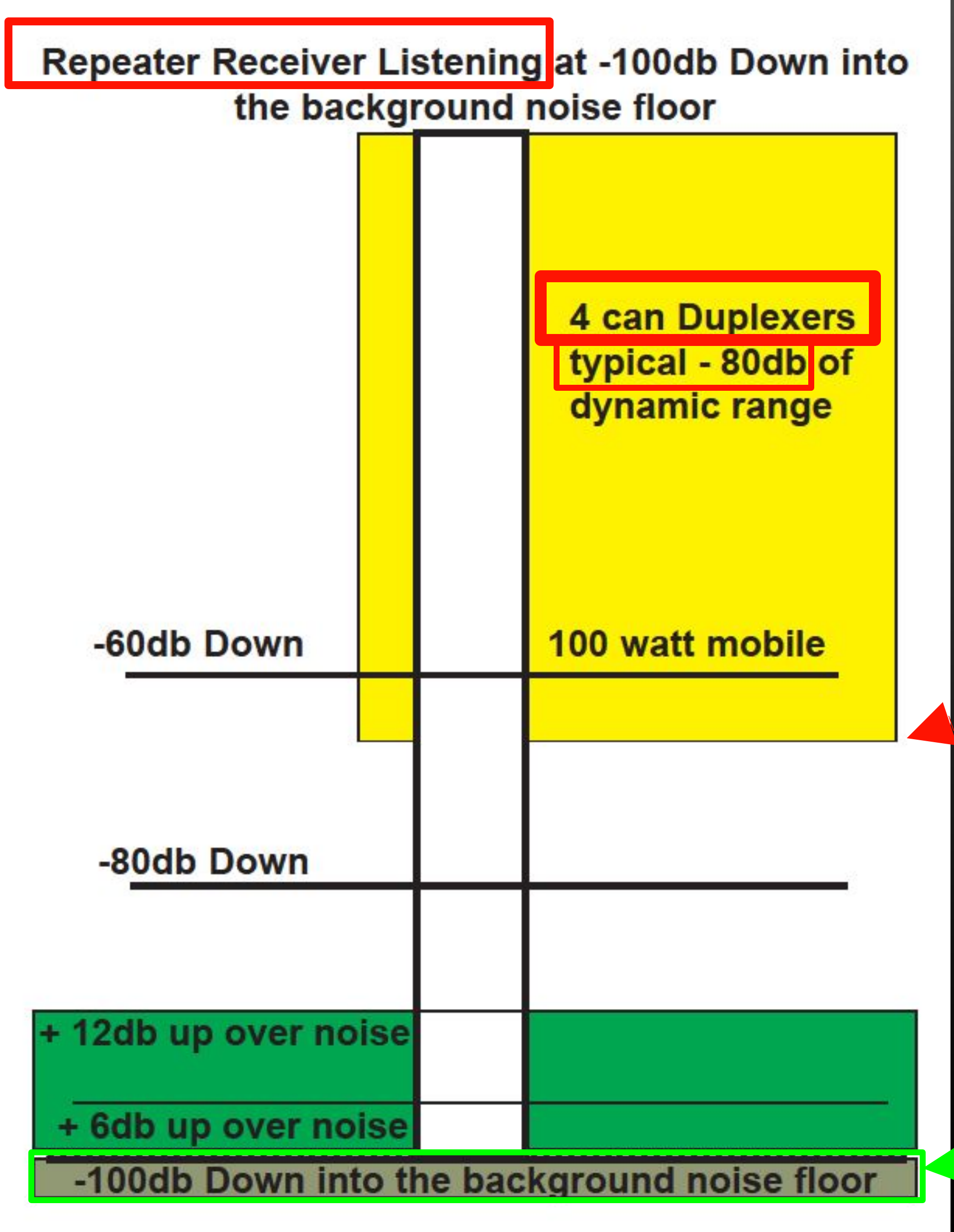

Repeater Receiver Listening at -100db Down into the background noise floor
4 can Duplexers typical - 80db of dynamic range
-60db Down
50 watt mobile
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

50 Watt Mobile, just below repeater noise level - 60db Range down on poorly tuned system

37db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters

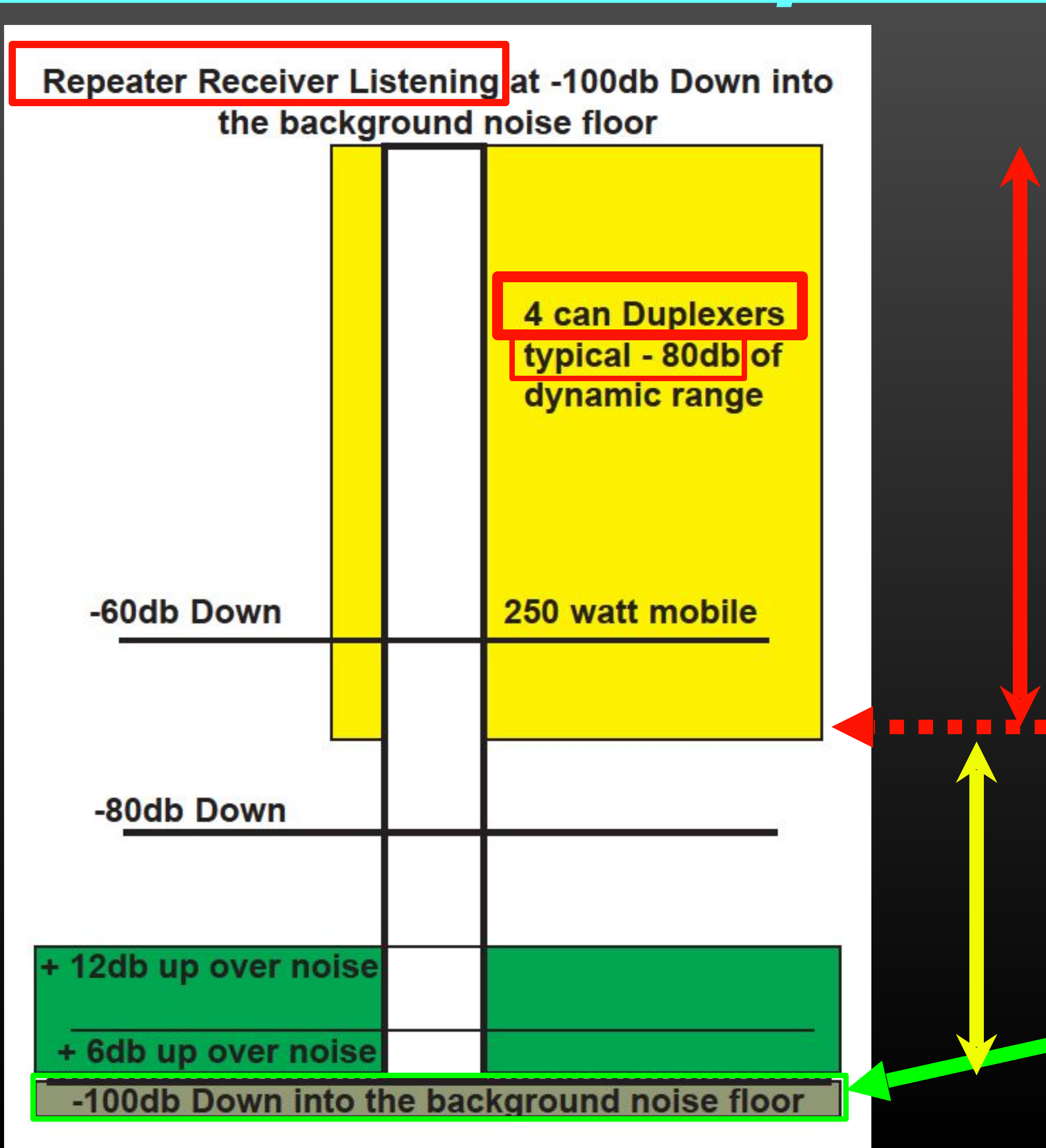

Repeater Receiver Listening at -100db Down into the background noise floor
4 can Duplexers typical - 80db of dynamic range
-60db Down
100 watt mobile
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

100 Watt Mobile, just below repeater noise level - 60db Range down on poorly tuned system

34db above the Back Ground Noise Floor

© 2012 KL7BB

High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

4 can Duplexers typical - 80db of dynamic range

-60db Down

250 watt mobile

-80db Down

+ 12db up over noise

+ 6db up over noise

-100db Down into the background noise floor

250 Watt Mobile, just below repeater noise level - 60db Range down, on poorly tuned system

31db above the Back Ground Noise Floor

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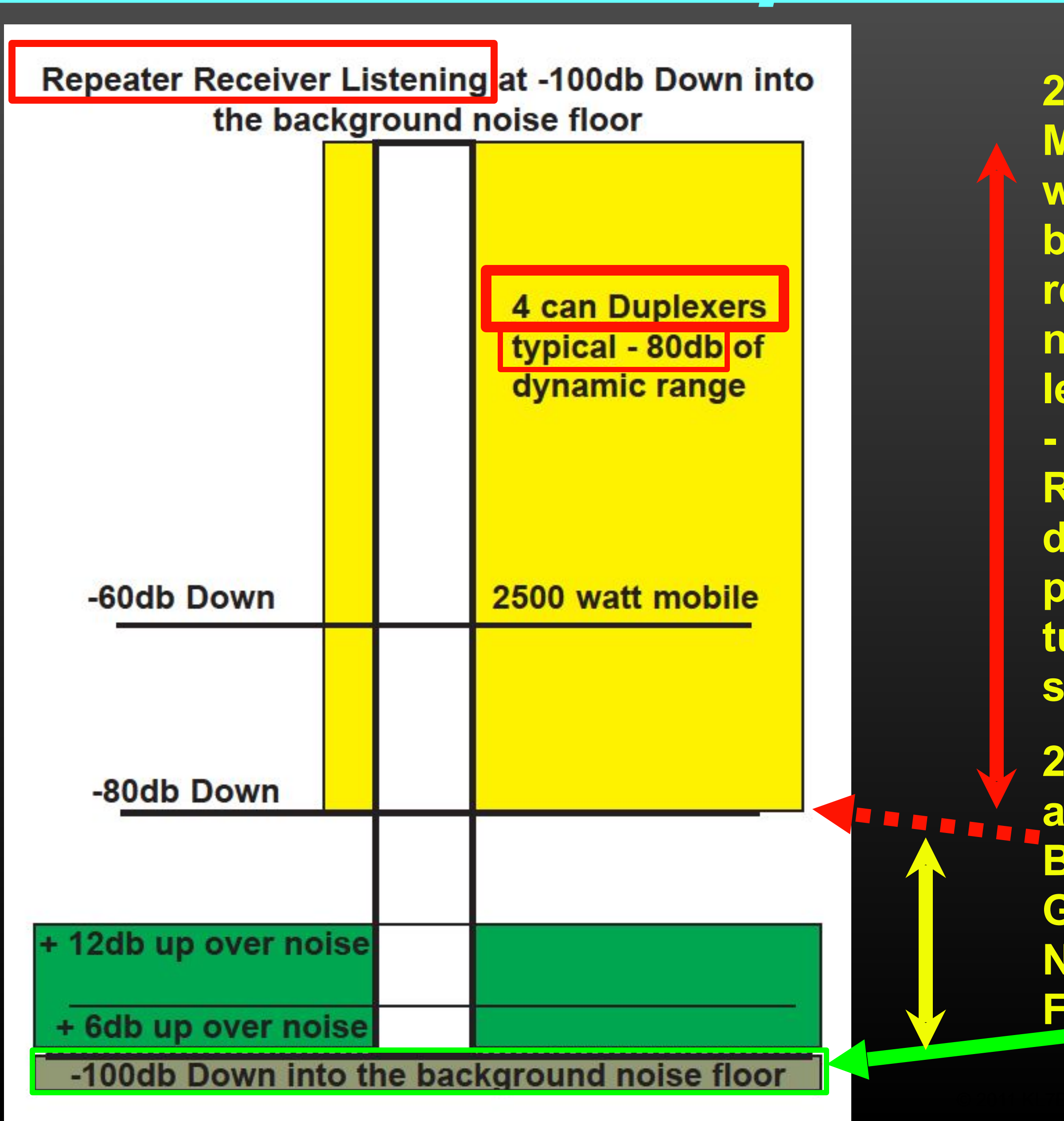
High Performance Repeaters


Repeater Receiver Listening at -100db Down into the background noise floor
4 can Duplexers typical - 80db of dynamic range
-60db Down
2500 watt mobile
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

2500 Watt Mobile, way below repeater noise level - 60db Range down, on poorly tuned system

20db above the Back Ground Noise Floor

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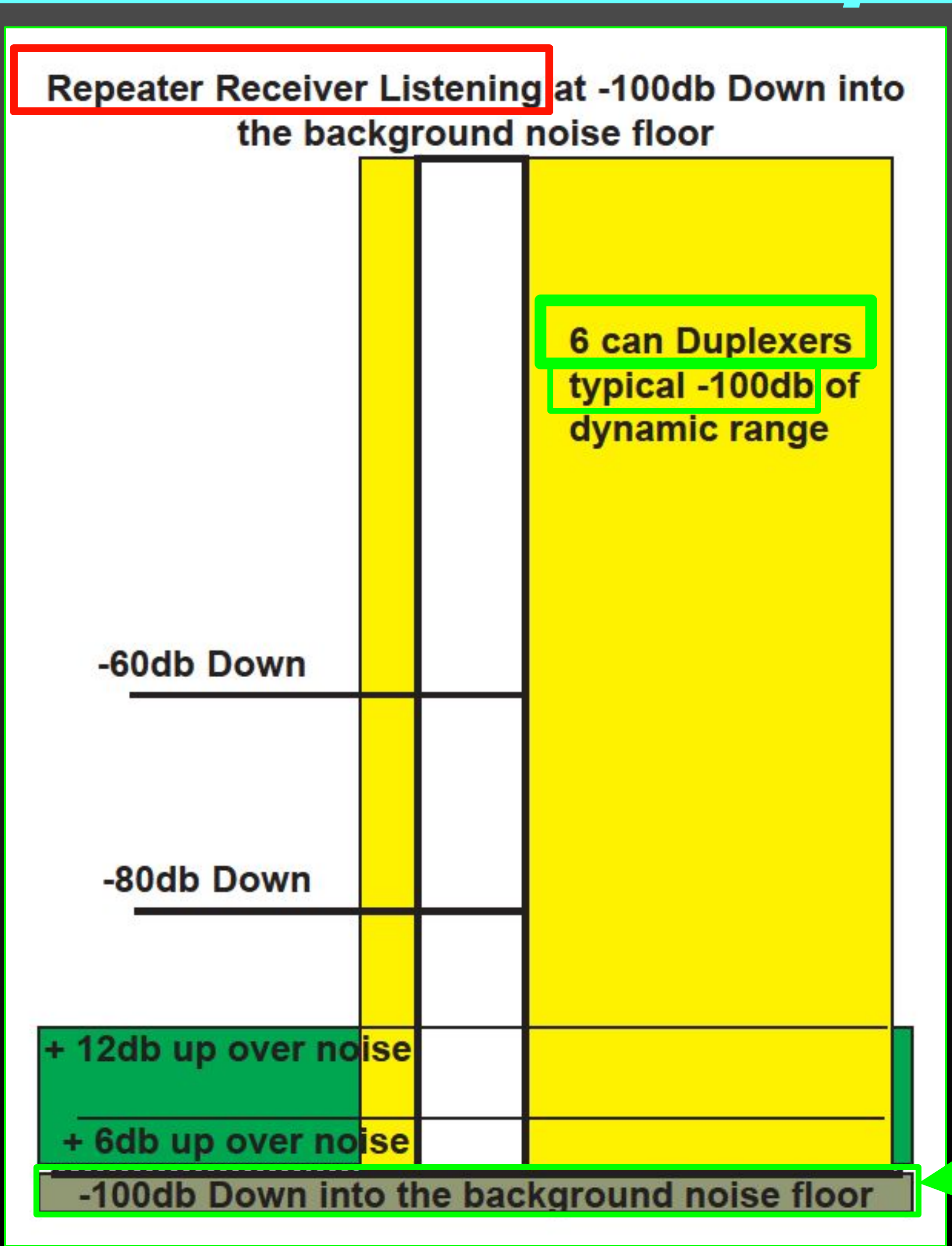
High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor
6 can Duplexers typical -100db of dynamic range
-60db Down
-80db Down
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

6 CANS

- 100db Range down. To the Back Ground Noise Floor

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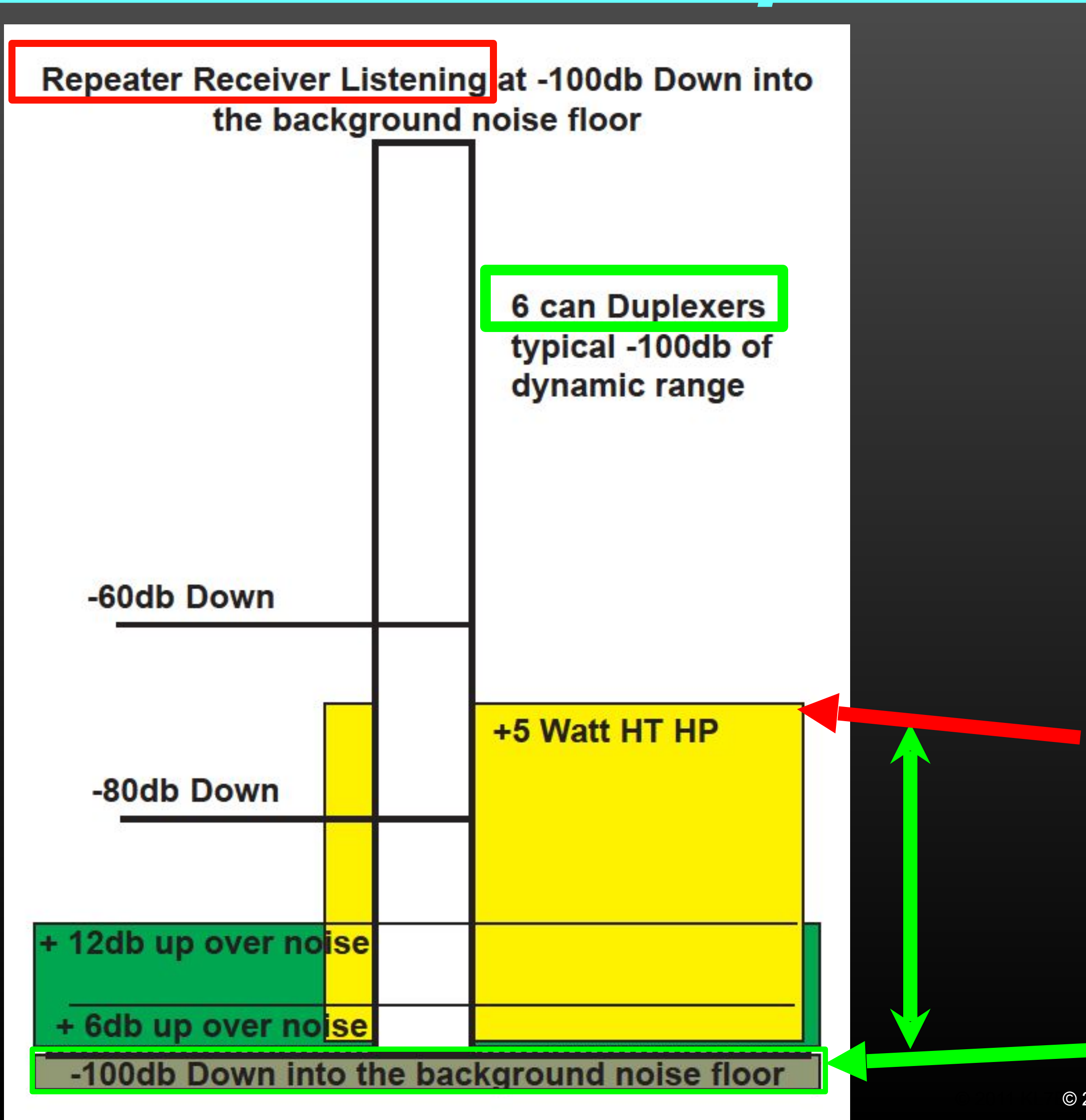
High Performance Repeaters


Repeater Receiver Listening at -100db Down into the background noise floor
6 can Duplexers typical -100db of dynamic range
-60db Down
-80db Down
+5 Watt HT HP
+ 12db up over noise
+ 6db up over noise
-100db Down into the background noise floor

6 CAN

- 100db Range down.

+32db above the Back Ground Noise Floor

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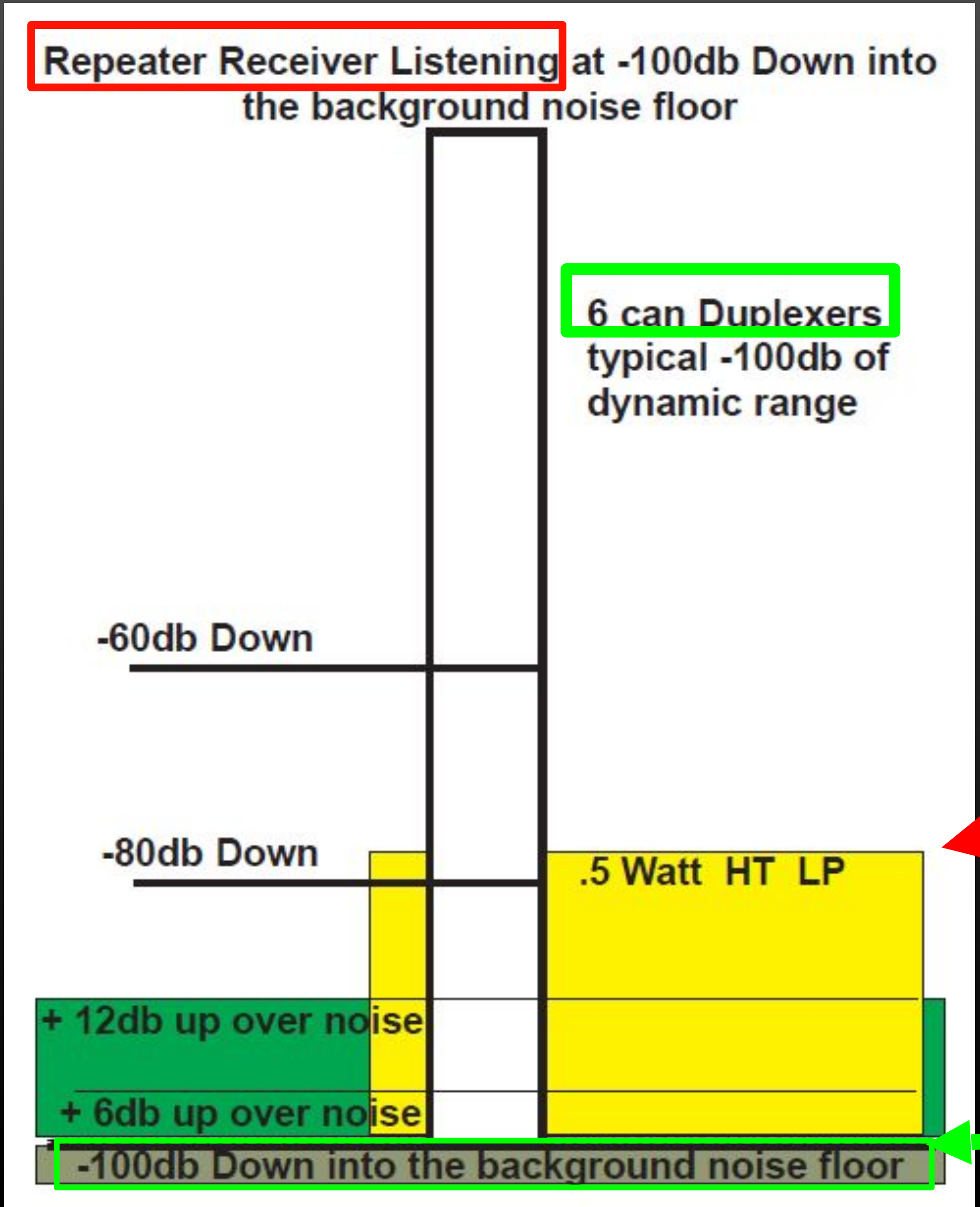
High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

6 can Duplexers typical -100db of dynamic range

-60db Down

-80db Down

.5 Watt HT LP

+ 12db up over noise

+ 6db up over noise

-100db Down into the background noise floor

6 CAN

-100db Range down.

+22db above the Back Ground Noise Floor

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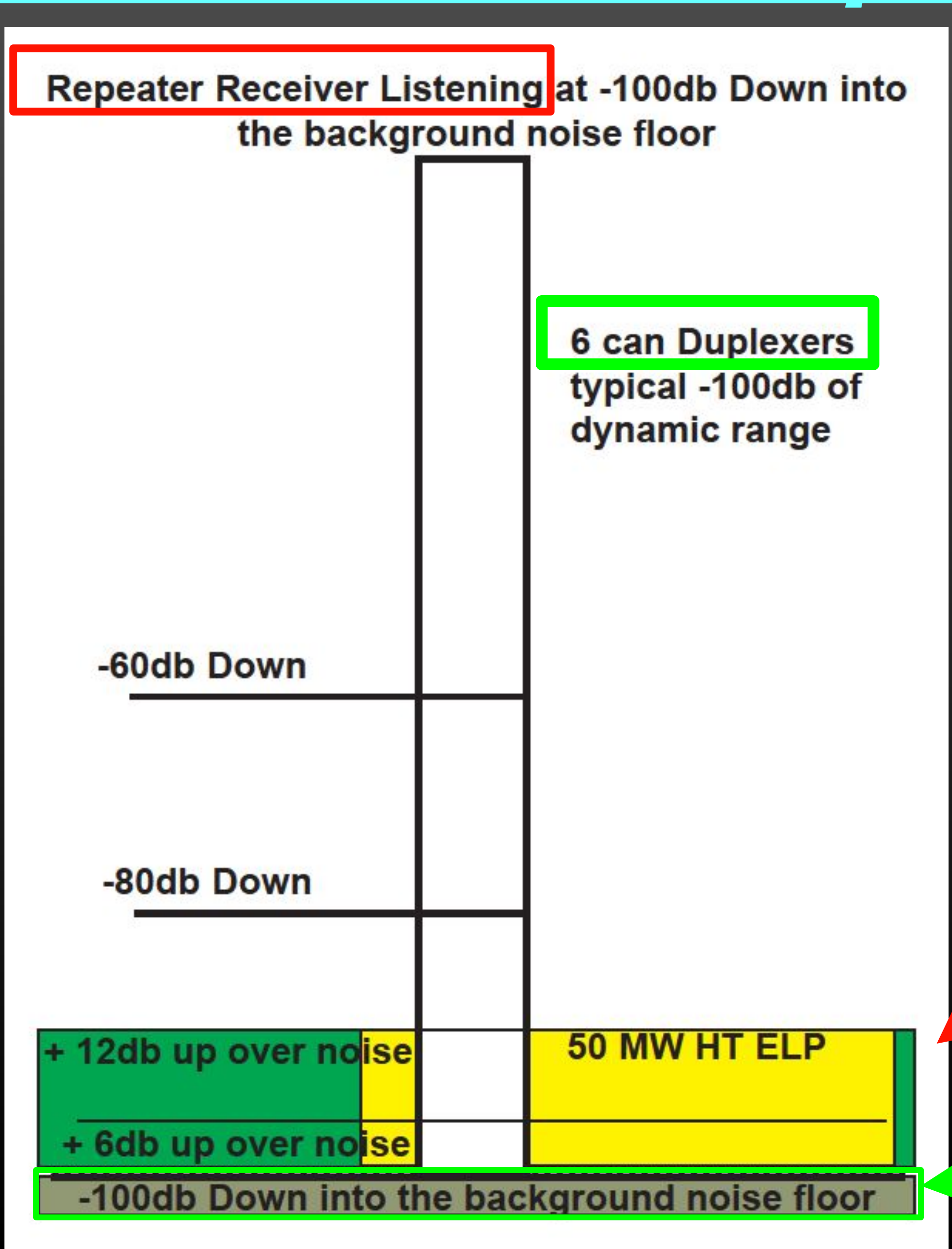
High Performance Repeaters



Repeater Receiver Listening at -100db Down into the background noise floor

6 can Duplexers typical -100db of dynamic range

-60db Down

-80db Down

+ 12db up over noise

50 MW HT ELP

+ 6db up over noise

-100db Down into the background noise floor

6 CAN

- 100db Range down.

+12db above the Back Ground Noise Floor

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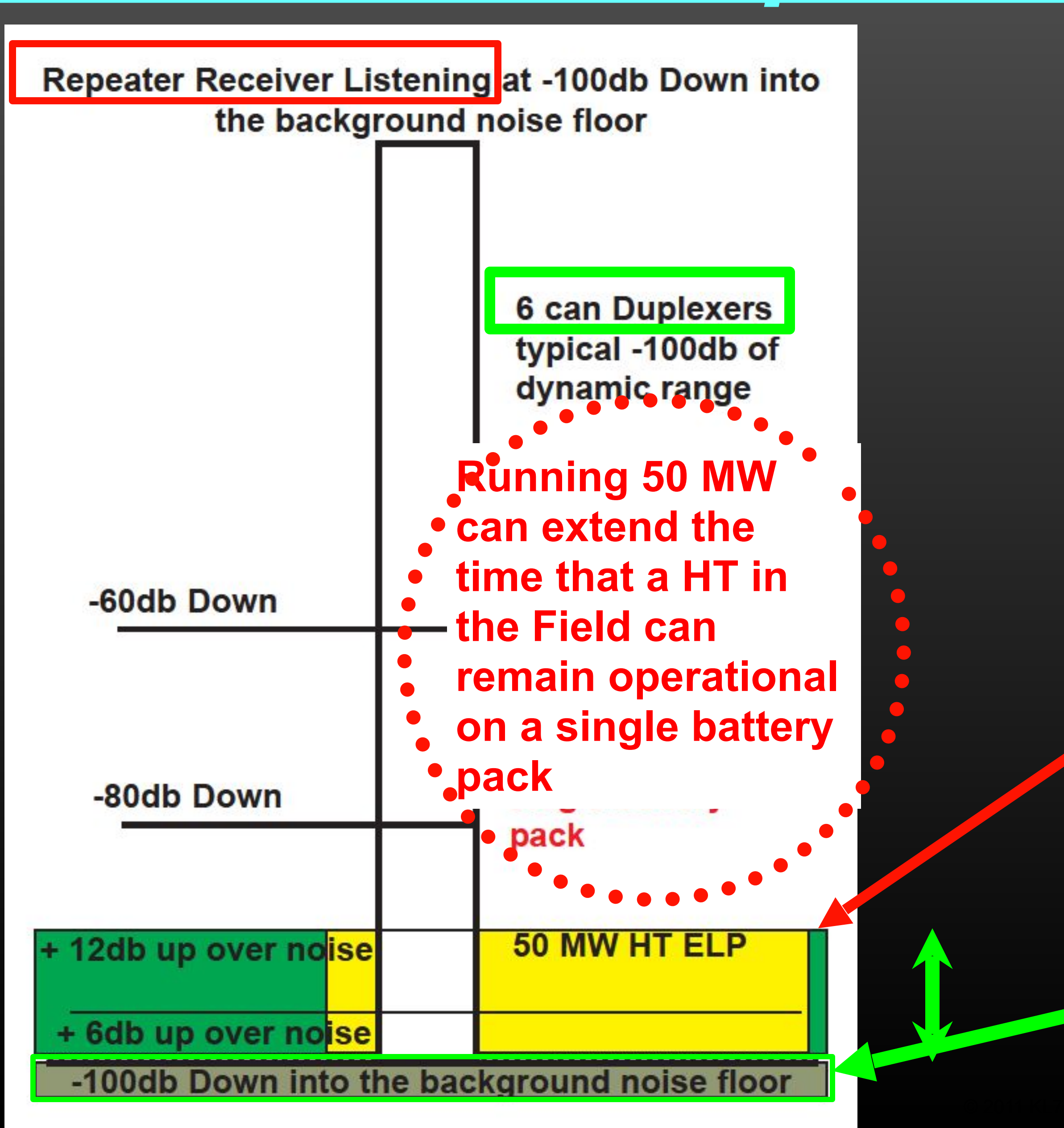
High Performance Repeaters


Repeater Receiver Listening at -100db Down into the background noise floor
6 can Duplexers typical -100db of dynamic range
-60db Down
-80db Down
+ 12db up over noise
+ 6db up over noise
50 MW HT ELP
-100db Down into the background noise floor

Running 50 MW can extend the time that a HT in the Field can remain operational on a single battery pack

6 CAN

- 100db Range down.

+12db above the Back Ground Noise Floor

33m

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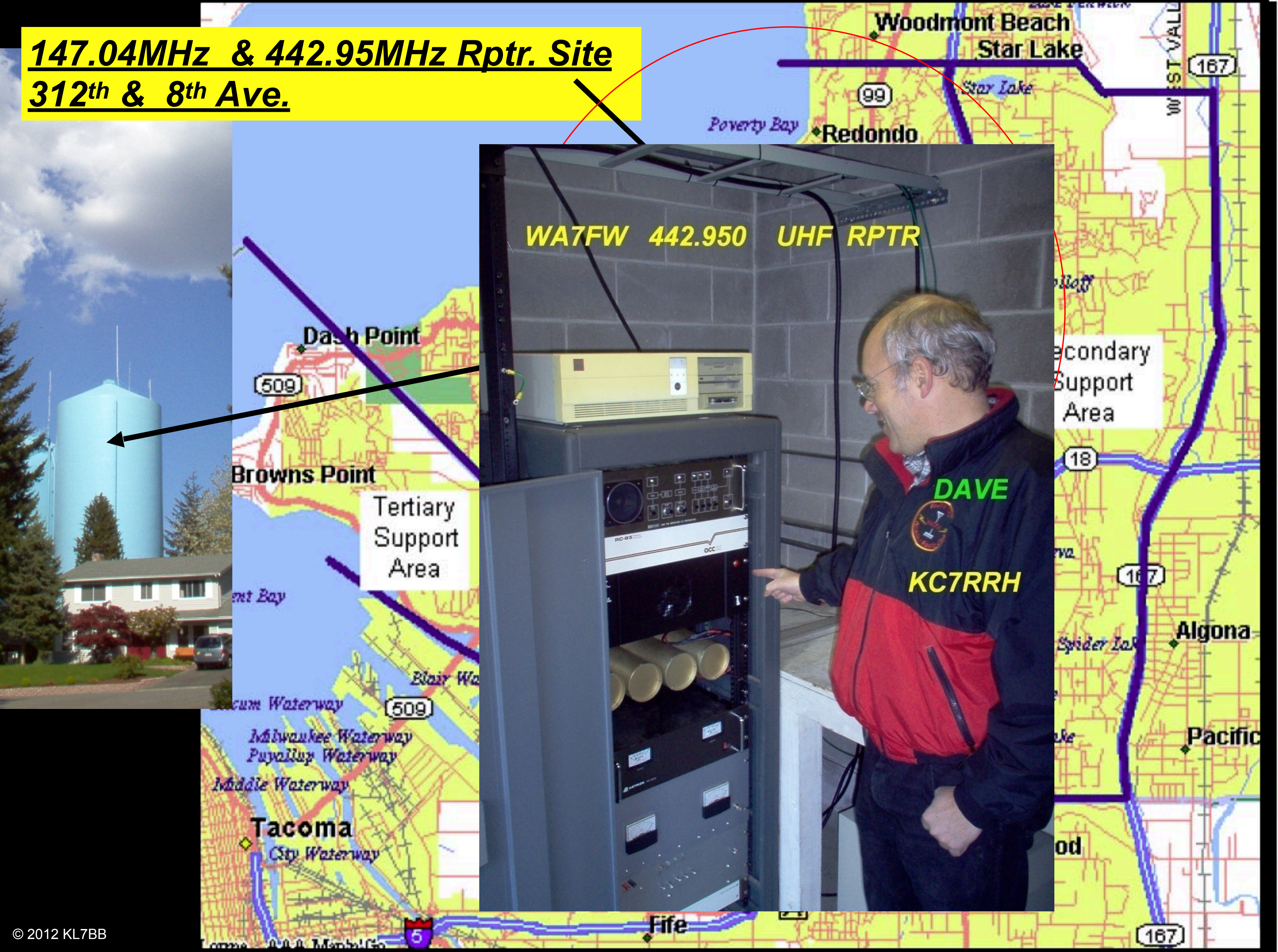
147.04MHz & 442.95MHz Rptr. Site
312th & 8th Ave.



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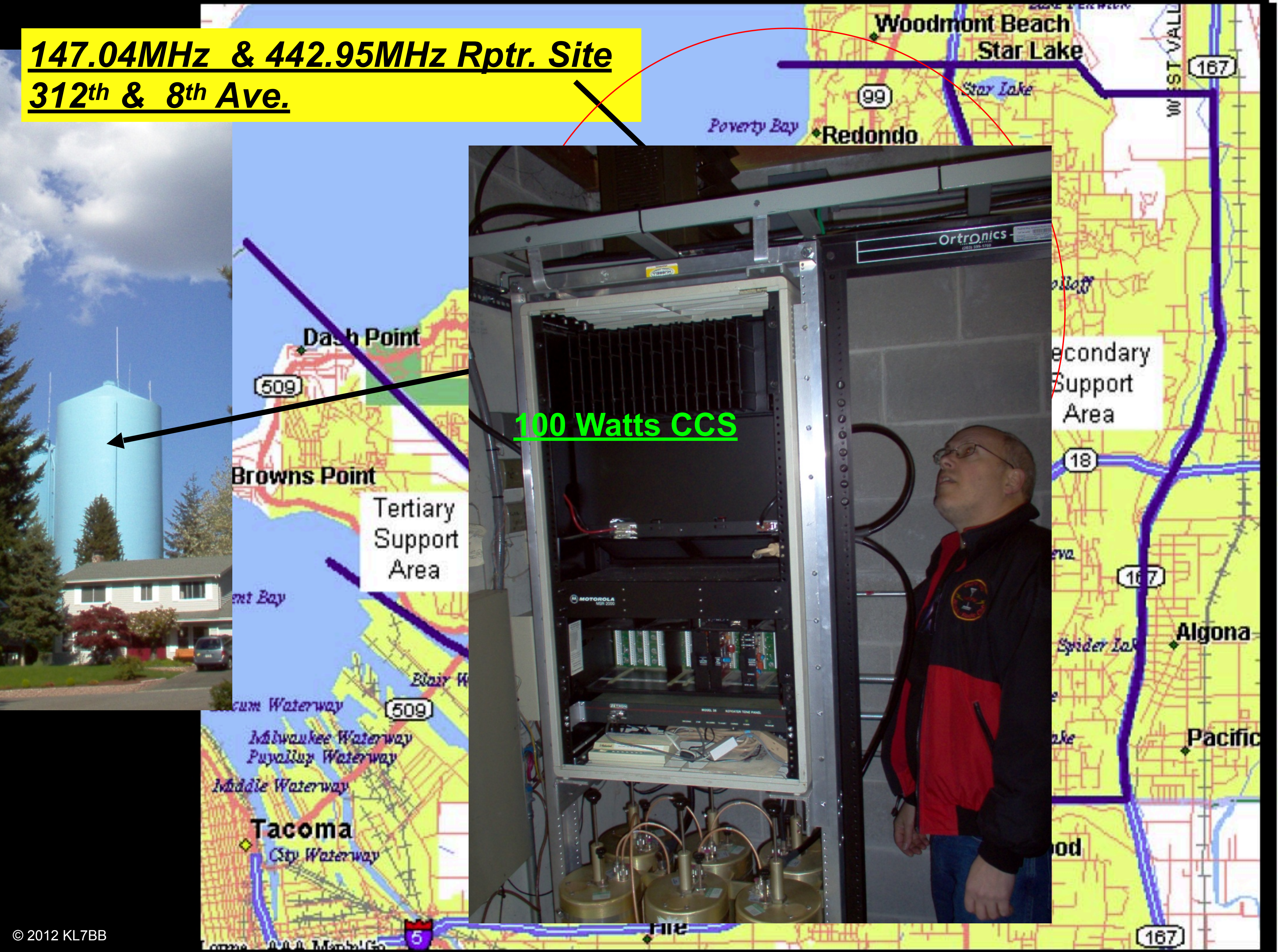
312th & 8th Ave.



100 Watts CCS

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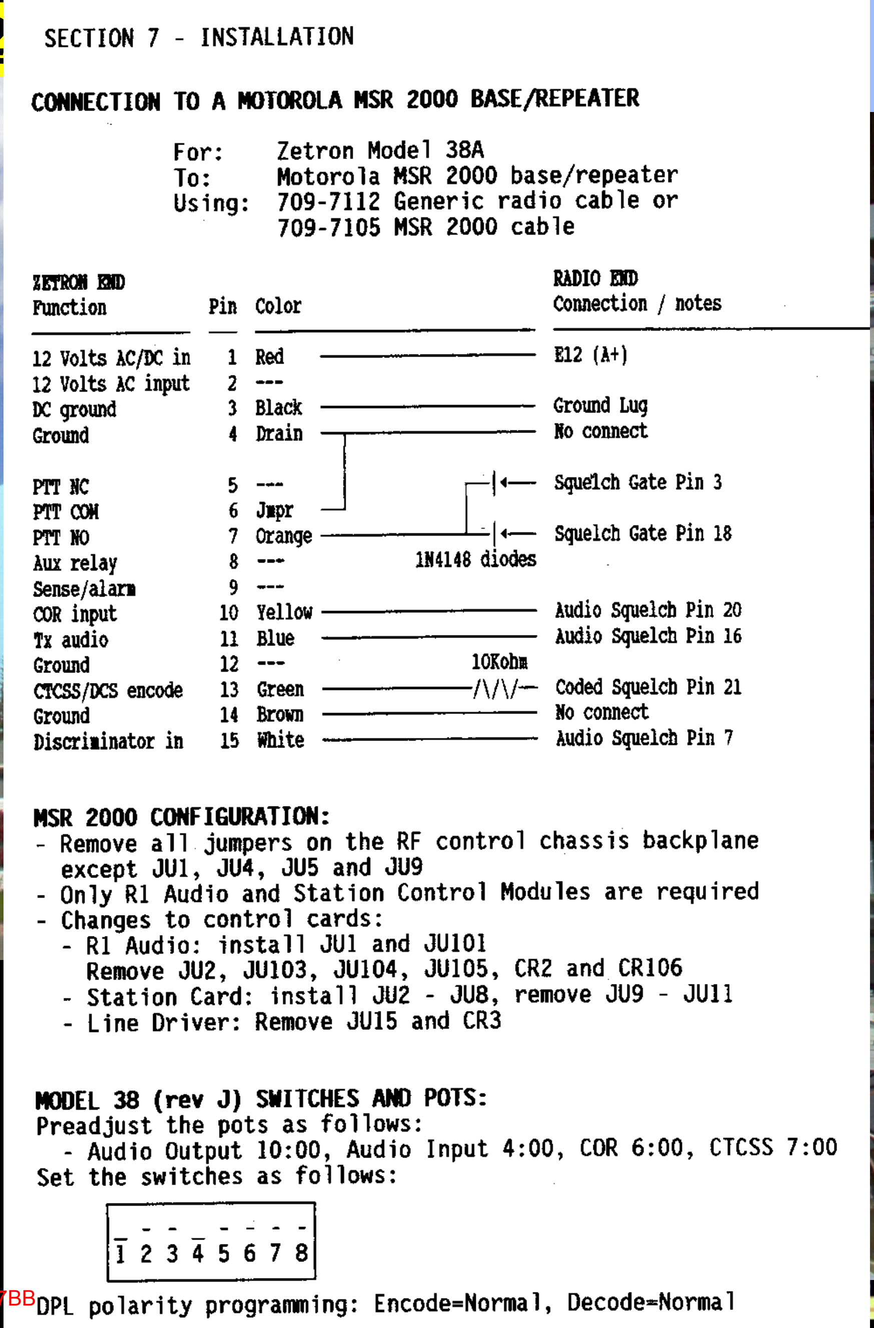
312



CONNECTION TO A MOTOROLA MSR 2000 BASE/REPEATER

For: Zetron Model 38A
To: Motorola MSR 2000 base/repeater
Using: 709-7112 Generic radio cable or
709-7105 MSR 2000 cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	E12 (A+)
12 Volts AC input	2	---	
DC ground	3	Black	Ground Lug
Ground	4	Drain	No connect
PTT NC	5	---	Squelch Gate Pin 3
PTT COM	6	Jmpr	
PTT NO	7	Orange	Squelch Gate Pin 18
Aux relay	8	---	1N4148 diodes
Sense/alarm	9	---	
COR input	10	Yellow	Audio Squelch Pin 20
Tx audio	11	Blue	Audio Squelch Pin 16
Ground	12	---	10Kohm
CTCSS/DCS encode	13	Green	Coded Squelch Pin 21
Ground	14	Brown	No connect
Discriminator in	15	White	Audio Squelch Pin 7

MSR 2000 CONFIGURATION:

- Remove all jumpers on the RF control chassis backplane except JU1, JU4, JU5 and JU9
- Only R1 Audio and Station Control Modules are required
- Changes to control cards:
  - R1 Audio: install JU1 and JU101
    Remove JU2, JU103, JU104, JU105, CR2 and CR106
  - Station Card: install JU2 - JU8, remove JU9 - JU11
  - Line Driver: Remove JU15 and CR3

MODEL 38 (rev J) SWITCHES AND POTS:

Preadjust the pots as follows:
- Audio Output 10:00, Audio Input 4:00, COR 6:00, CTCSS 7:00

Set the switches as follows:

1 2 3 4 5 6 7 8

DPL polarity programming: Encode=Normal, Decode=Normal

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147.04MHz & 442.95MHz Rptr. Site

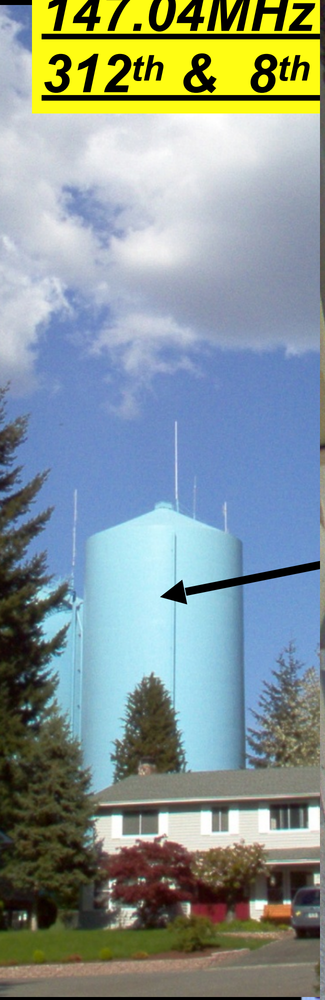
100 Watts

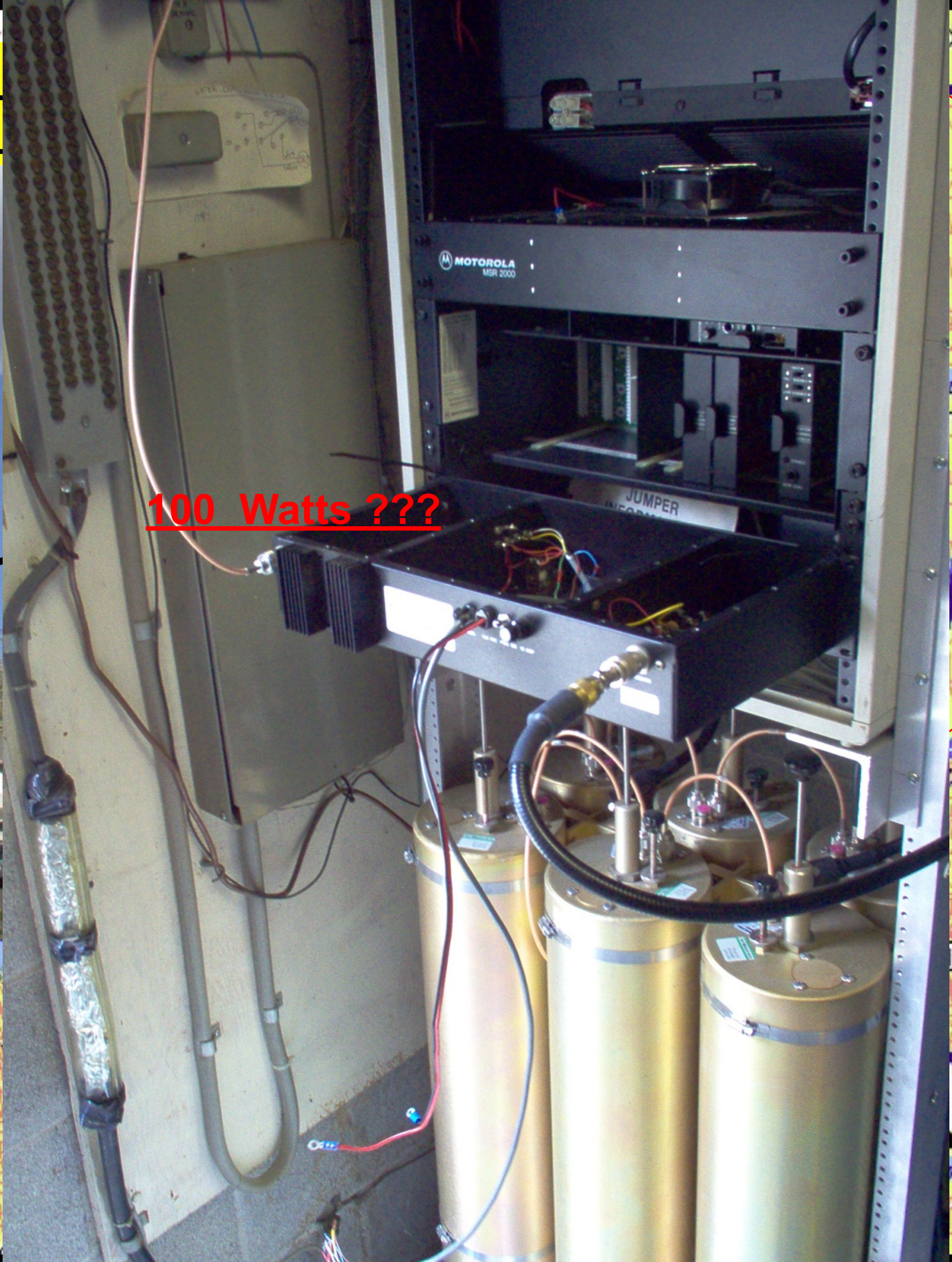
CCS

© 20

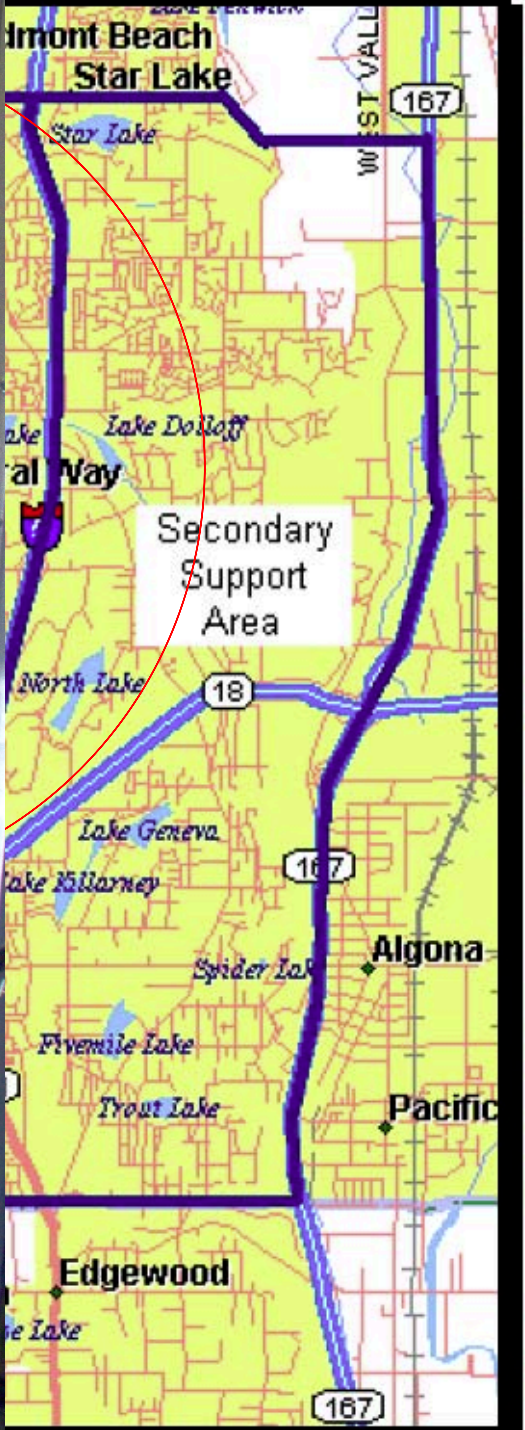
147.04MHz

312th & 8th





100 Watts ???



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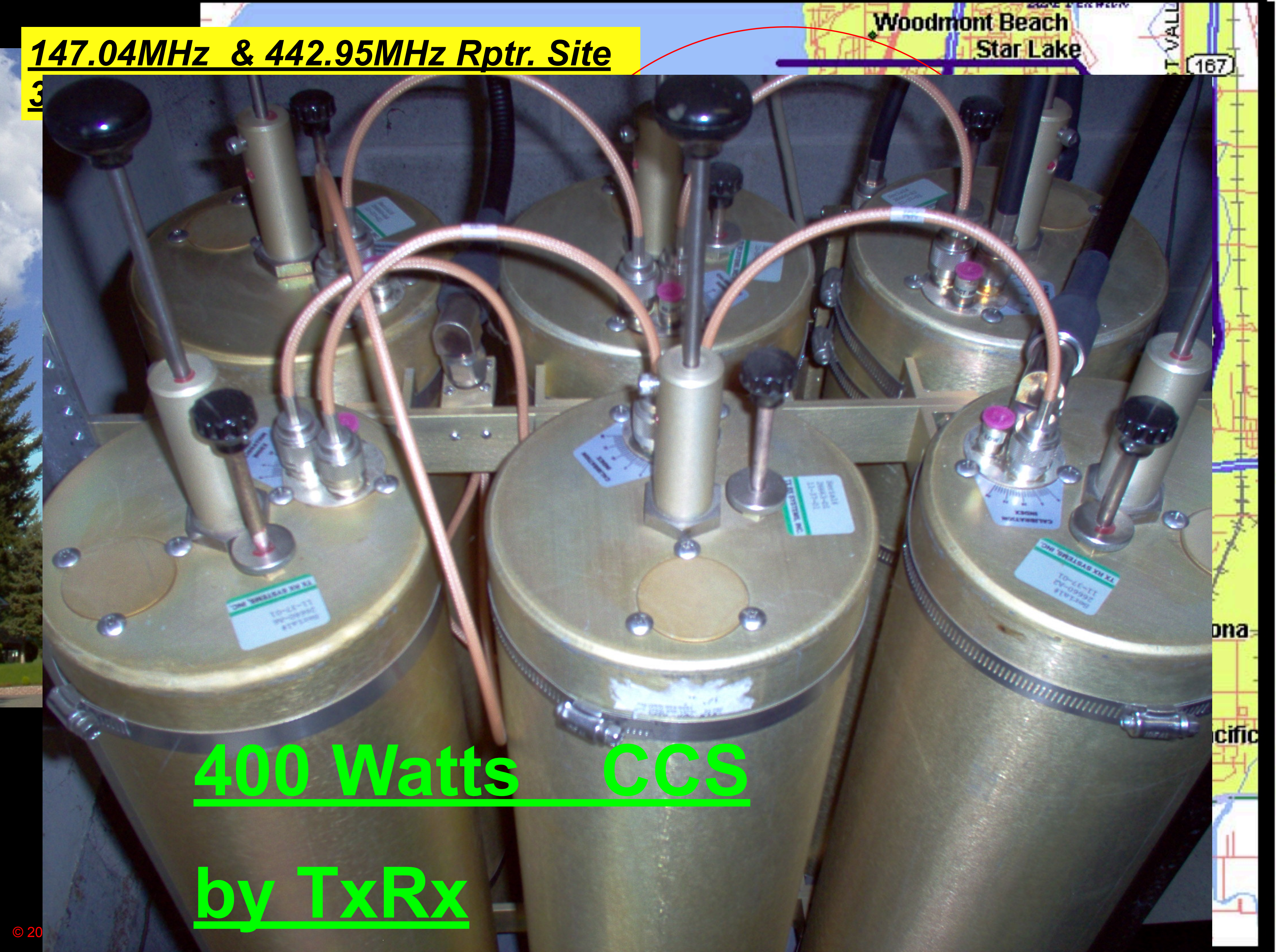
3



400 Watts CCS

by TxRx

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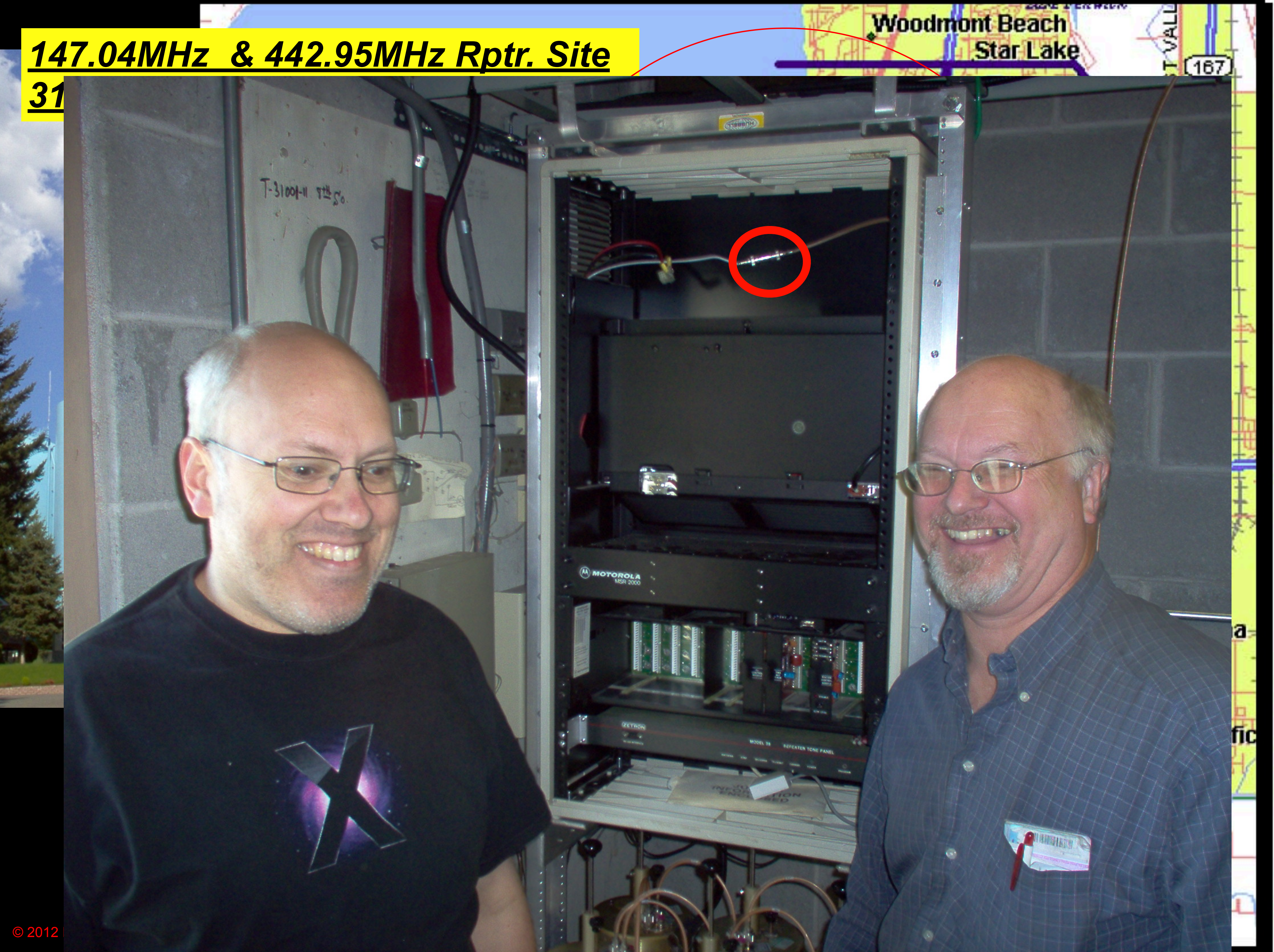
31



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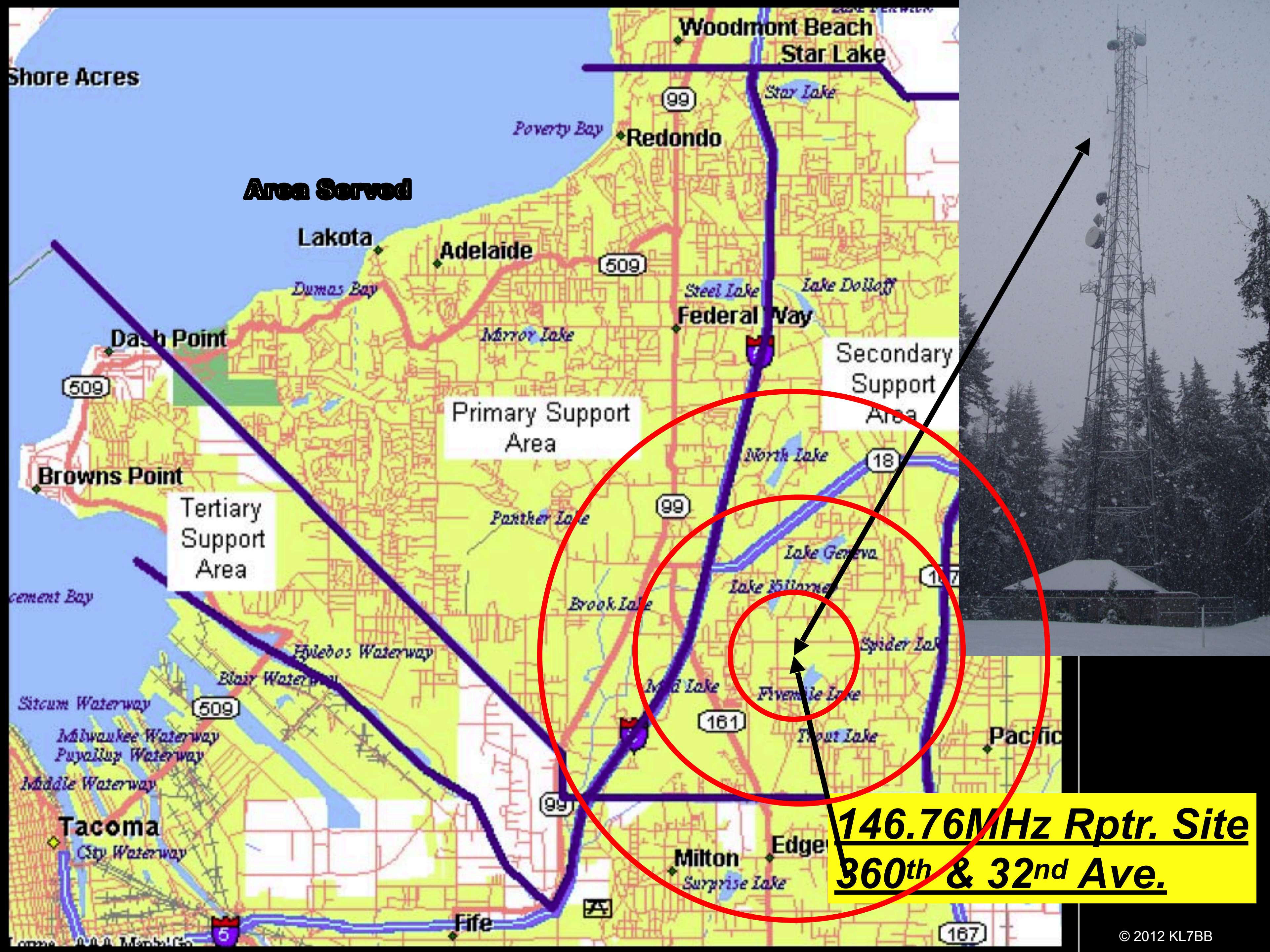

Area Served

Primary Support Area

Secondary Support Area

Tertiary Support Area

146.76MHz Rptr. Site
360th & 32nd Ave.

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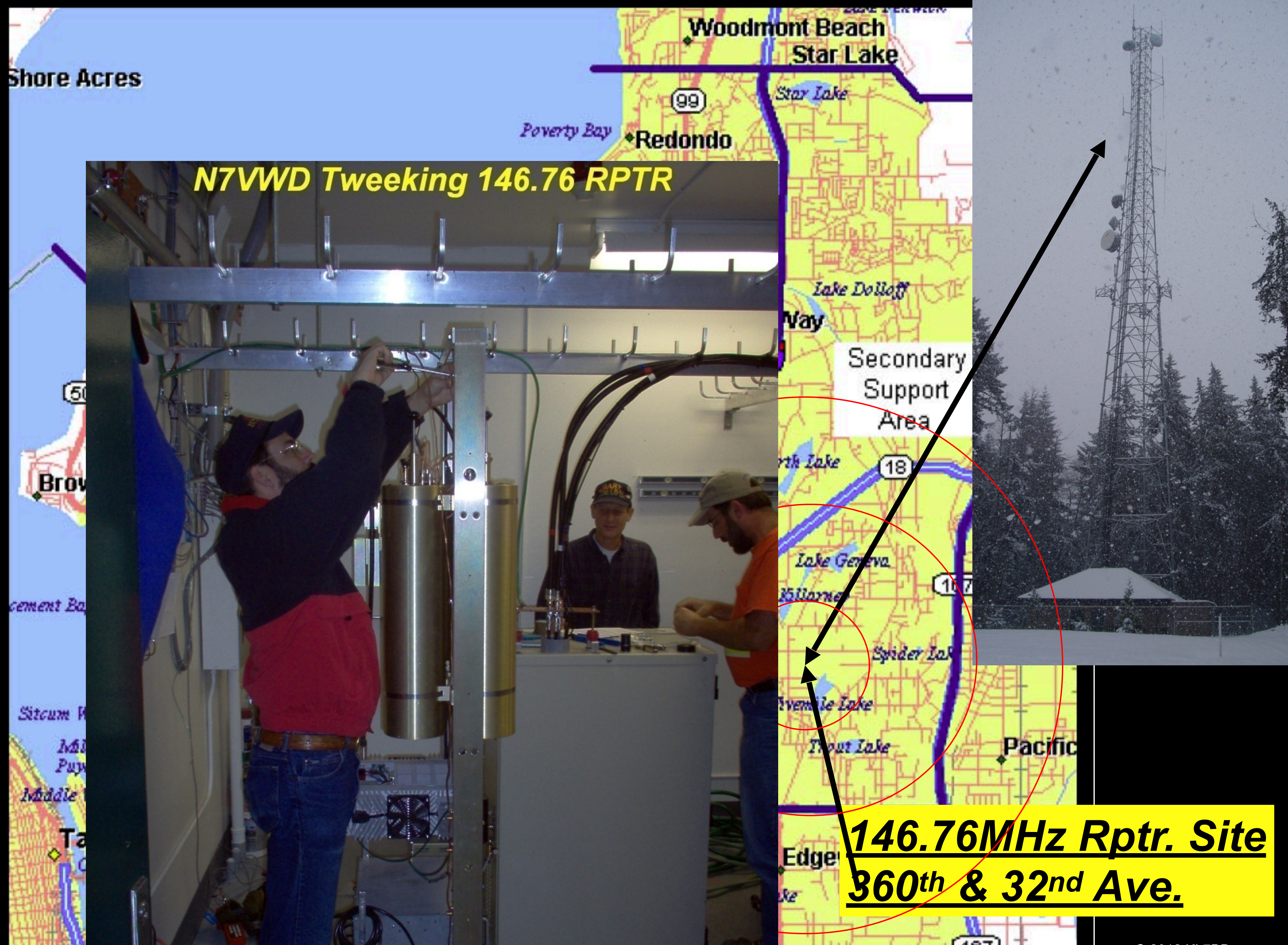

N7VWD Tweeking 146.76 RPTR

146.76MHz Rptr. Site
360th & 32nd Ave.

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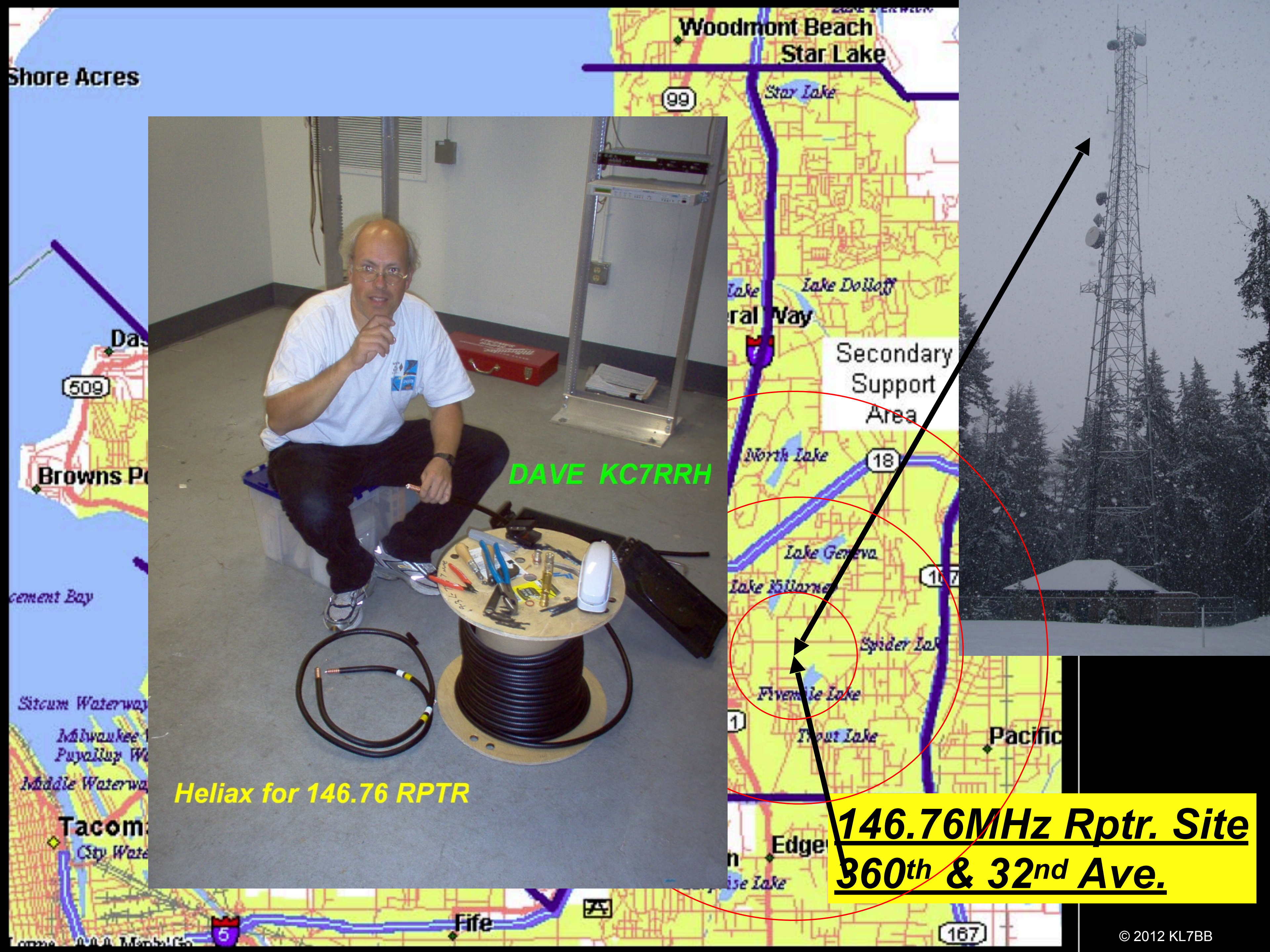

DAVE KC7RRH

Heliax for 146.76 RPTR

146.76MHz Rptr. Site
360th & 32nd Ave.

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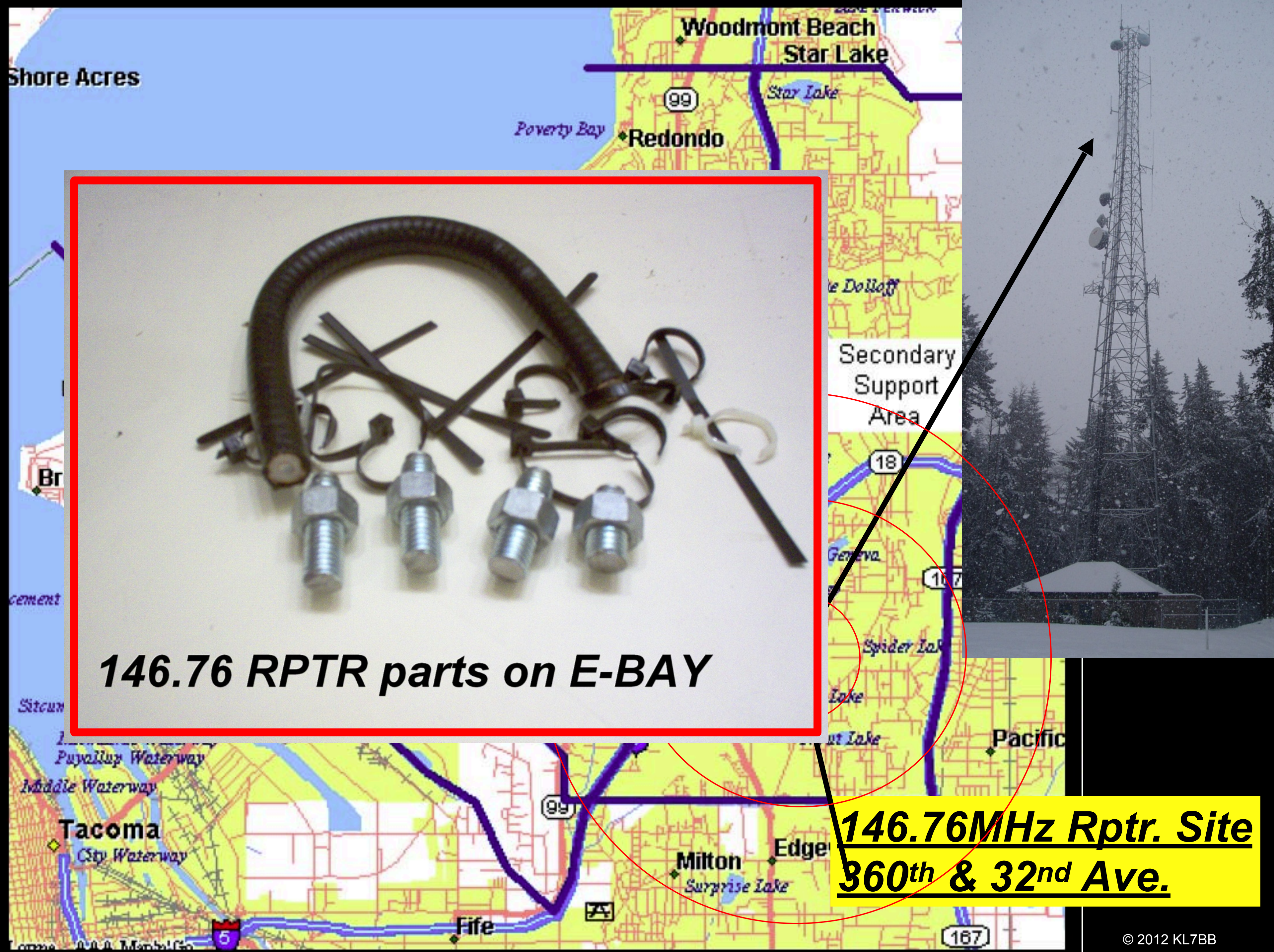

146.76 RPTR parts on E-BAY

146.76MHz Rptr. Site
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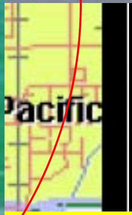
It is Hard to Train Dolphins



Hz Rptr. Site
32nd Ave.

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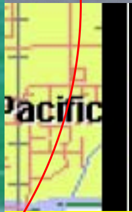
It is even
Harder to Train
Farm Animals



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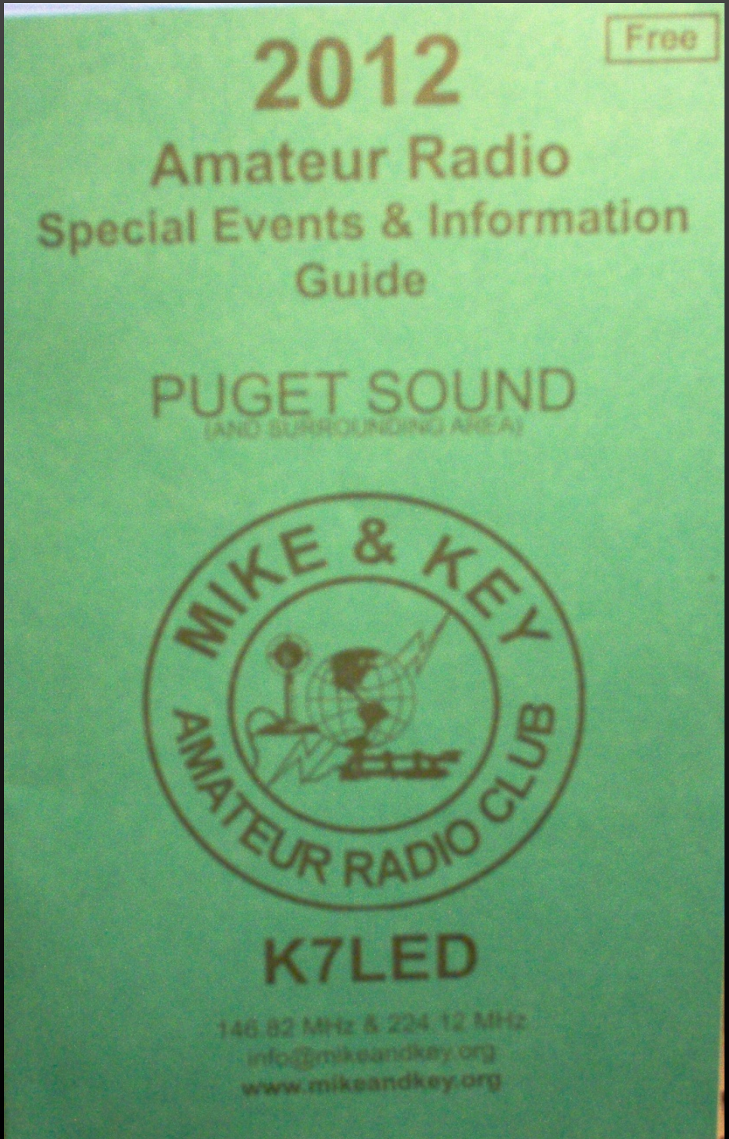
High Performance Repeaters



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2012

High Performance Repeaters

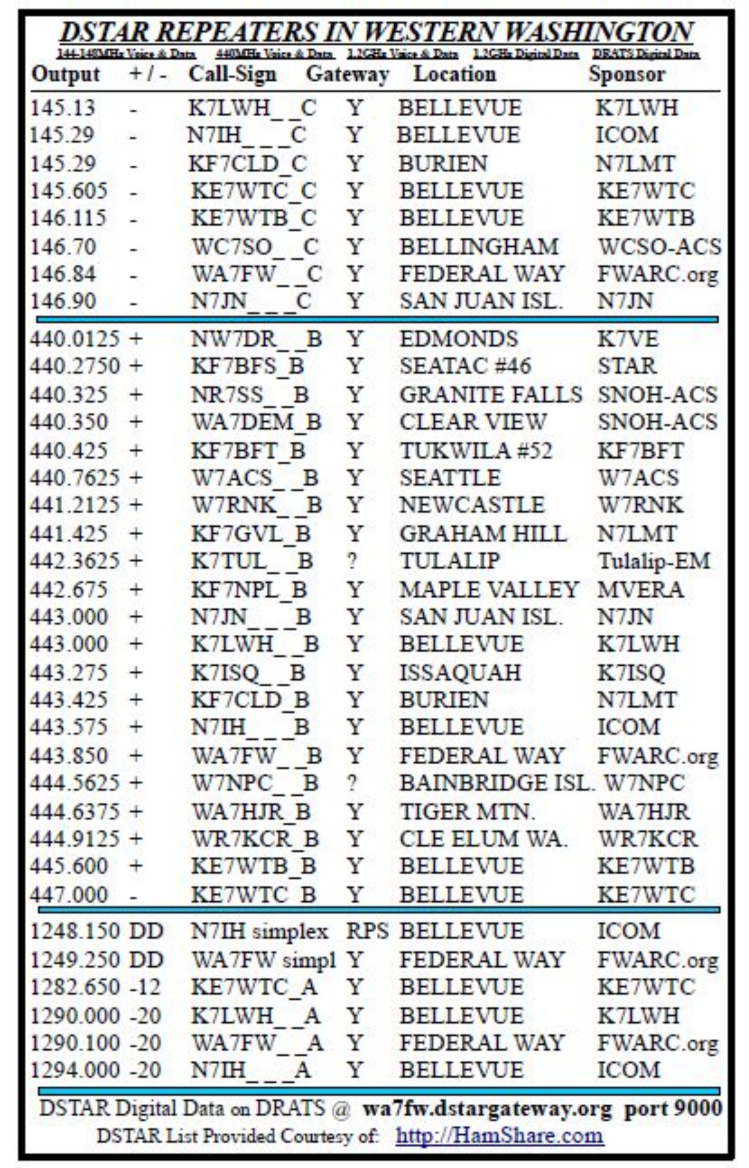
C 146.84 -DV

B 441.425+DV

B 443.850+DV

DD 1249.250spx

A 1290.100 -20



DSTAR REPEATERS IN WESTERN WASHINGTON

144-148MHz Voice & Data 440MHz Voice & Data 1.2GHz Voice & Data 1.2GHz Digital Data DRATS Digital Data

Output	+ / -	Call-Sign	Gateway	Location	Sponsor
145.13	-	K7LWH__C	Y	BELLEVUE	K7LWH
145.29	-	N7IH___C	Y	BELLEVUE	ICOM
145.29	-	KF7CLD_C	Y	BURIEN	N7LMT
145.605	-	KE7WTC_C	Y	BELLEVUE	KE7WTC
146.115	-	KE7WTB_C	Y	BELLEVUE	KE7WTB
146.70	-	WC7SO__C	Y	BELLINGHAM	WCSO-ACS
146.84	-	WA7FW__C	Y	FEDERAL WAY	FWARC.org
146.90	-	N7JN___C	Y	SAN JUAN ISL.	N7JN
440.0125	+	NW7DR__B	Y	EDMONDS	K7VE
440.2750	+	KF7BFS_B	Y	SEATAC #46	STAR
440.325	+	NR7SS__B	Y	GRANITE FALLS	SNOH-ACS
440.350	+	WA7DEM_B	Y	CLEAR VIEW	SNOH-ACS
440.425	+	KF7BFT_B	Y	TUKWILA #52	KF7BFT
440.7625	+	W7ACS__B	Y	SEATTLE	W7ACS
441.2125	+	W7RNK__B	Y	NEWCASTLE	W7RNK
441.425	+	KF7GVL_B	Y	GRAHAM HILL	N7LMT
442.3625	+	K7TUL__B	?	TULALIP	Tulalip-EM
442.675	+	KF7NPL_B	Y	MAPLE VALLEY	MVERA
443.000	+	N7JN___B	Y	SAN JUAN ISL.	N7JN
443.000	+	K7LWH__B	Y	BELLEVUE	K7LWH
443.275	+	K7ISQ__B	Y	ISSAQUAH	K7ISQ
443.425	+	KF7CLD_B	Y	BURIEN	N7LMT
443.575	+	N7IH___B	Y	BELLEVUE	ICOM
443.850	+	WA7FW__B	Y	FEDERAL WAY	FWARC.org
444.5625	+	W7NPC__B	?	BAINBRIDGE ISL.	W7NPC
444.6375	+	WA7HJR_B	Y	TIGER MTN.	WA7HJR
444.9125	+	WR7KCR_B	Y	CLE ELUM WA.	WR7KCR
445.600	+	KE7WTB_B	Y	BELLEVUE	KE7WTB
447.000	-	KE7WTC_B	Y	BELLEVUE	KE7WTC
1248.150	DD	N7IH simplex	RPS	BELLEVUE	ICOM
1249.250	DD	WA7FW simpl	Y	FEDERAL WAY	FWARC.org
1282.650	-12	KE7WTC_A	Y	BELLEVUE	KE7WTC
1290.000	-20	K7LWH__A	Y	BELLEVUE	K7LWH
1290.100	-20	WA7FW__A	Y	FEDERAL WAY	FWARC.org
1294.000	-20	N7IH___A	Y	BELLEVUE	ICOM

DSTAR Digital Data on DRATS @ **wa7fw.dstargateway.org port 9000**

DSTAR List Provided Courtesy of: http://HamShare.com

D-STAR Repeaters for

Digital Voice

Slow Speed Digital Data

&

High Speed Digital Data

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Repeaters VHF & UHF

Today's VHF and UHF Digital repeater systems not only cover your local areas, but can be linked to other repeater systems to expand your local area network (LAN) of repeater(s) coverage. 146MHz, 440MHz, and 1.2GHz can all be interlinked at will, if you know the linking language.

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Repeater Sites

146.84 MHz	DV + SDD (DRATS)
443.85 MHz	DV + SDD (DRATS)
1290.1 MHz	DV + SDD (DRATS)
1249.25 MHz	Digital Data Only

Simplex Direct (Talk-Around)

Reflector 035C, +035A, 035B, 035D, 035E

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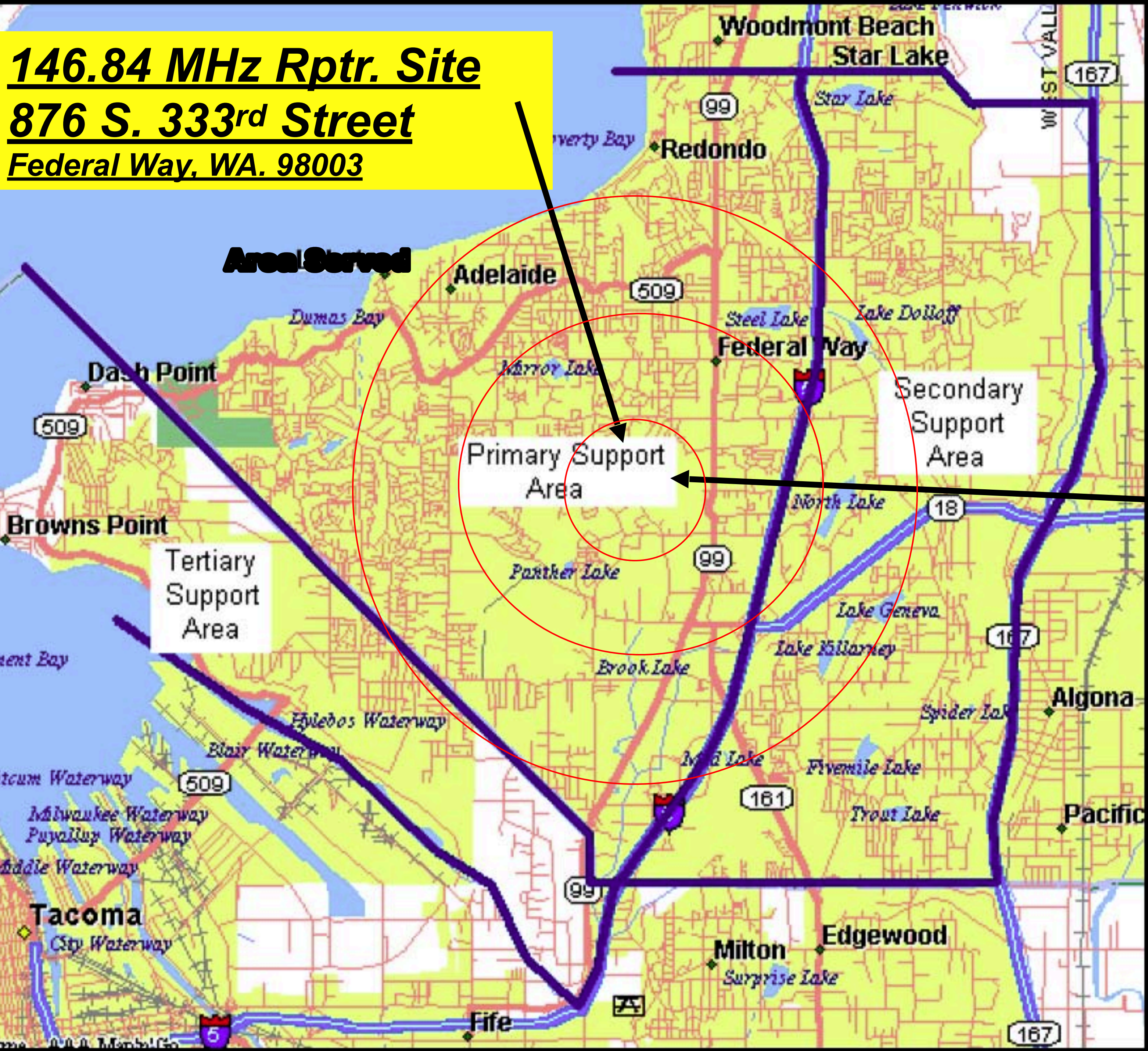

146.84 MHz Rptr. Site
876 S. 333rd Street
Federal Way, WA. 98003

146.84
443.85
1290.1
1249.25
MHz
DV & DD
Rptr. Site
876 S. 333rd Street
Federal Way, WA. 98003

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Repeaters VHF & UHF

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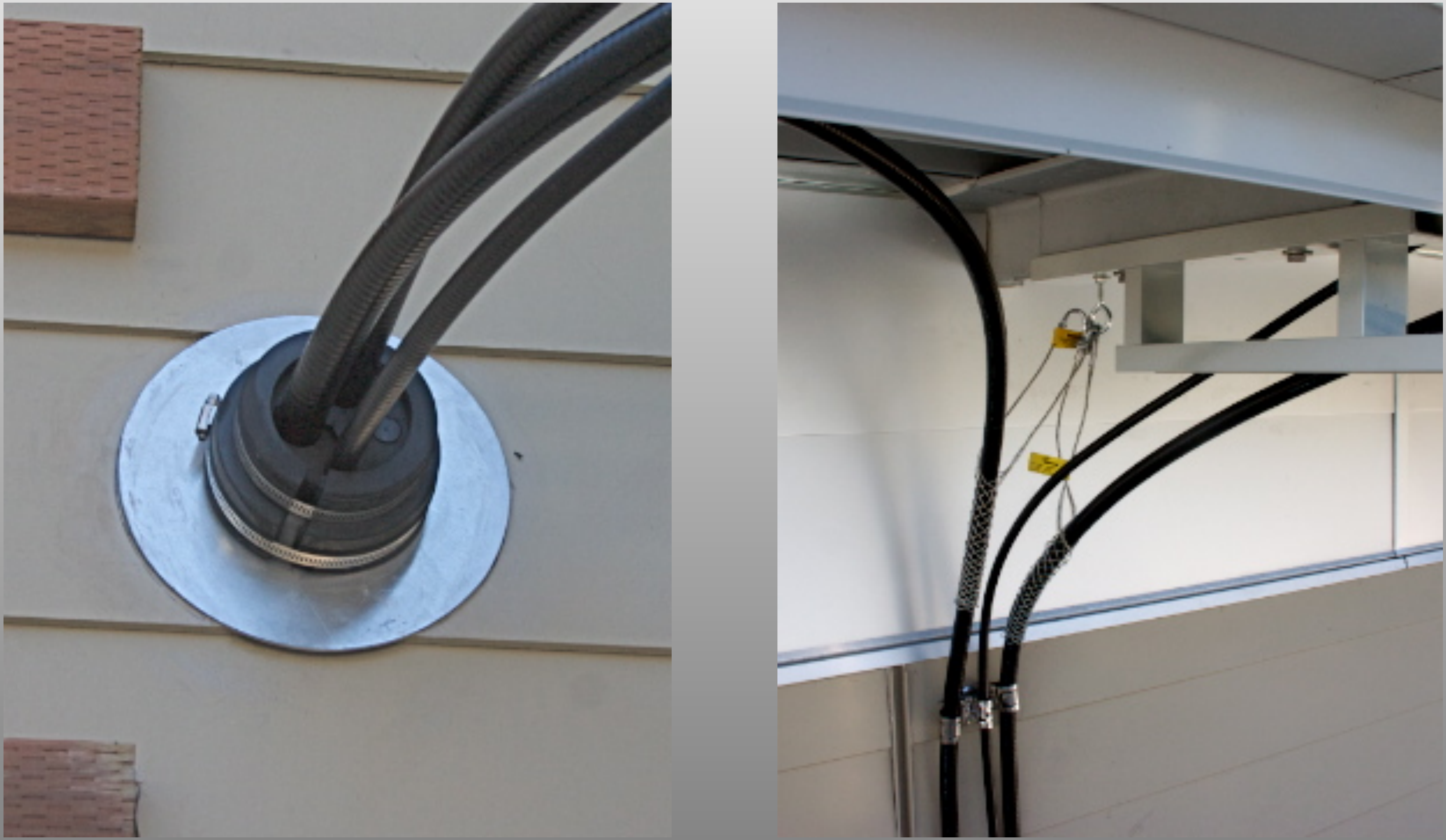

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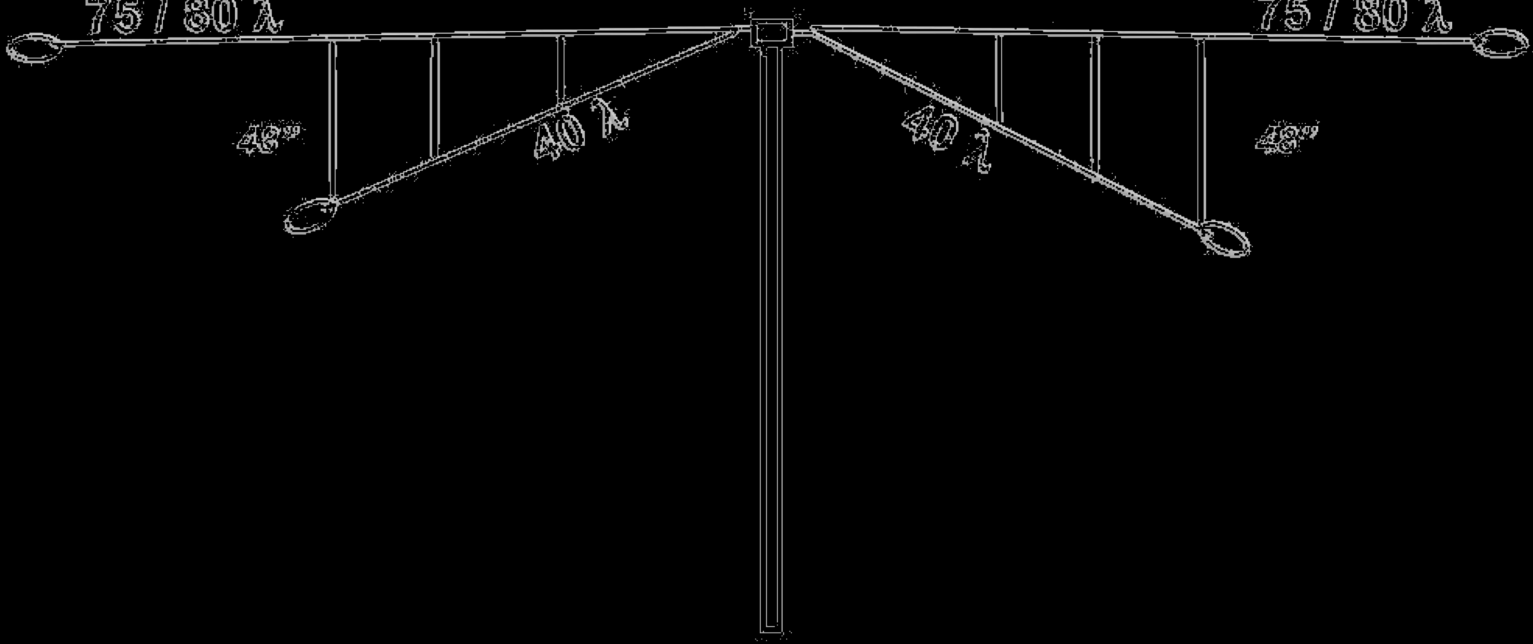
NVIS Dual BAND ANTENNA

High Performance Repeaters

How to Fund the Project



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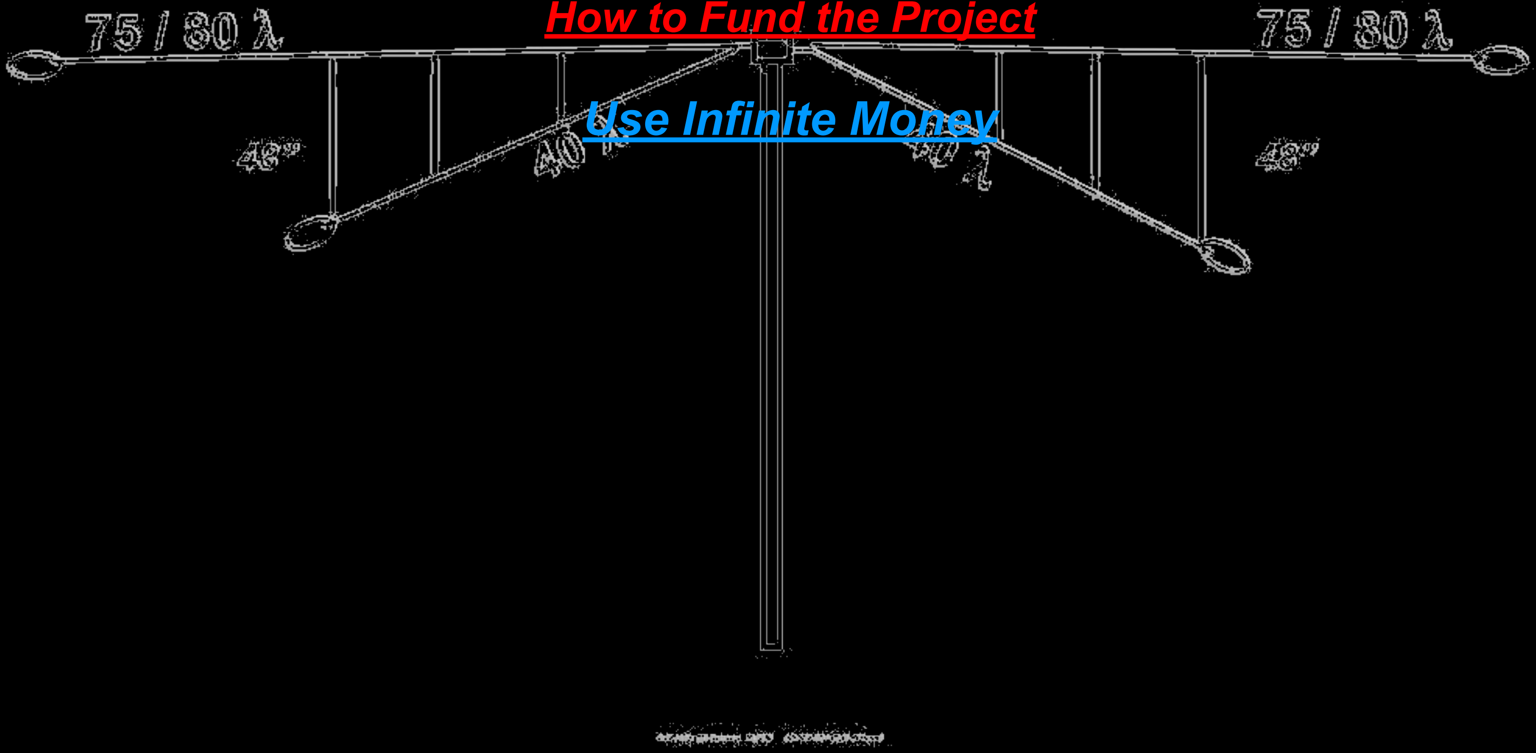
NVIS Dual-BAND ANTENNA

High Performance Repeaters

How to Fund the Project



Use Infinite Money

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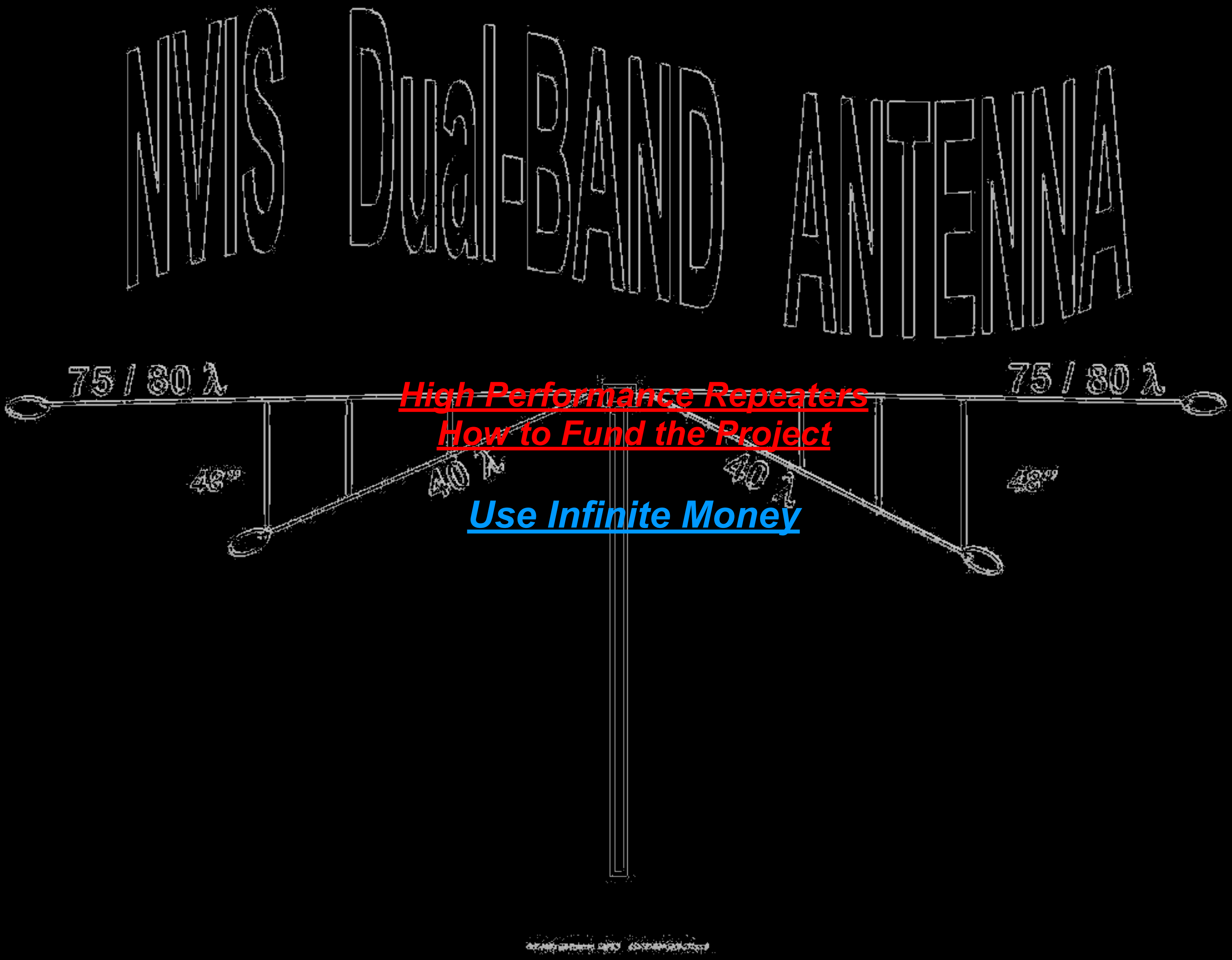

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How to Fund the Project

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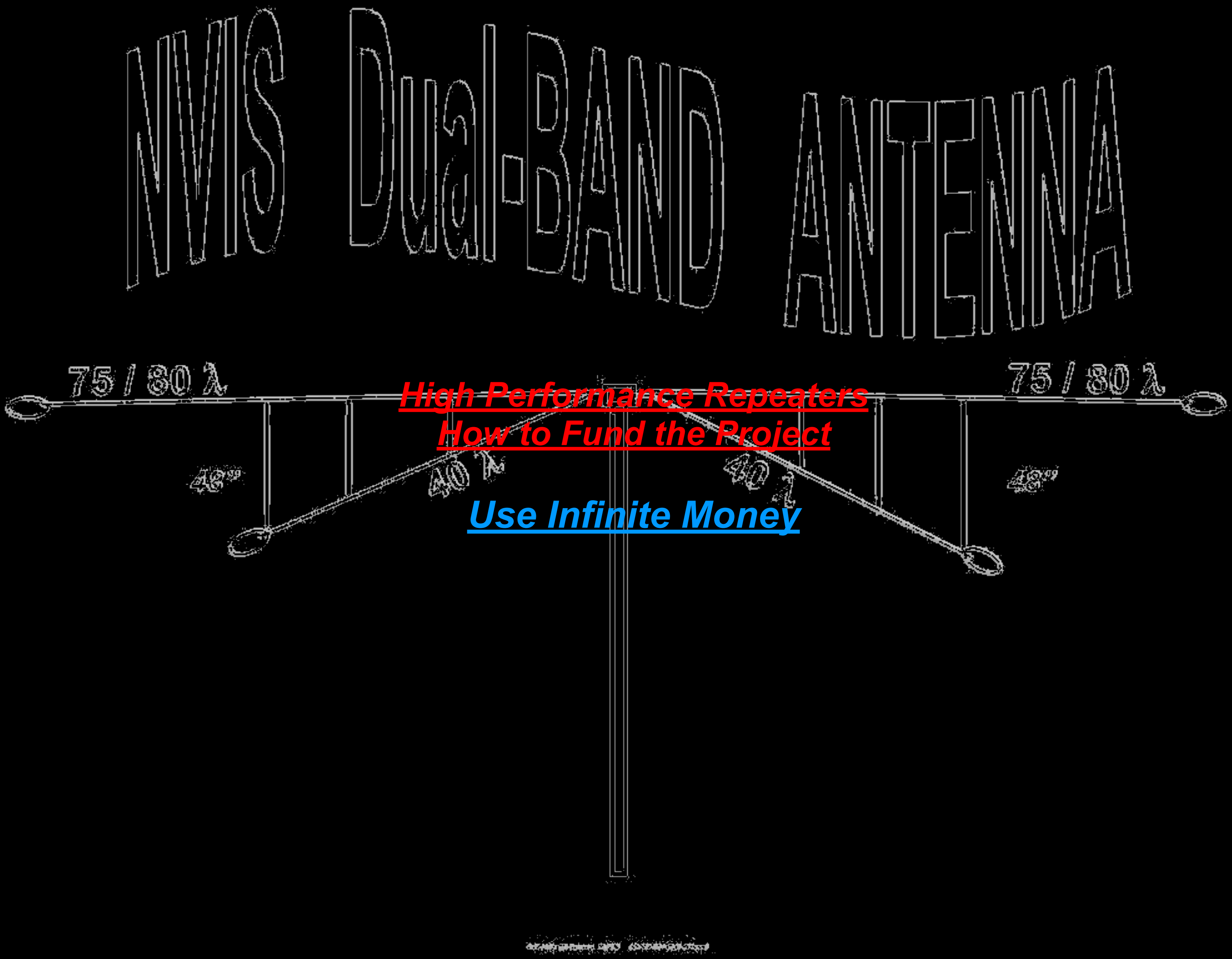

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